



Aerospace Medicine  
and Biology  
A Continuing  
Bibliography  
with Indexes

NASA SP-7011 (193)  
May 1979

National Aeronautics and  
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## ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series)    N79-15898 – N79-17793

IAA (A-10000 Series)    A79-20477 – A79-24524

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# **AEROSPACE MEDICINE AND BIOLOGY**

## **A CONTINUING BIBLIOGRAPHY WITH INDEXES**

### **(Supplement 193)**

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in April 1979 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*



Scientific and Technical Information Branch

1979

**National Aeronautics and Space Administration**

Washington, DC

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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 209 reports, articles and other documents announced during April 1979 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964, since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1979 Supplements.

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## TYPICAL CITATION AND ABSTRACT FROM STAR

NASA SPONSORED	DOCUMENT	NASA ACCESSION	NUMBER	N79-10741#	McDonnell-Douglas Astronautics Co Huntington Beach Calif	TITLE	GENERALIZED ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM COMPUTER PROGRAM (G1894).	AUTHOR	PHASE 3 Final Report R E McEnulty Sep 1978 23 p refs	REPORT	(Contract NAS9-14877) (NASA-CR-151836 MDC-G7699)	NUMBER	HC A02/MF A01-CSCLOK Avail NTIS	CONTRACT	OR GRANT	AVAILABILITY	SOURCE
COSATI	CODE	The work performed during Phase 3 of the Generalized Environmental Control Life Support System (ECLSS) Computer Program is reported Phase 3 of this program covered the period from December 1977 to September 1978. The computerized simulation of the Shuttle Orbiter ECLSS was upgraded in the following areas: (1) the payload loop of the Shuttle simulation was completely recorded and checked out. (2) the Shuttle simulation water and freon loop initialization logic was simplified to permit easier program input for the user. (3) the computerized simulation was modified to accept the WASP subroutine, which is a subroutine to evaluate the thermal properties of water and freon. (4) the 1108 operating system was upgraded by LEC. (5) the Shuttle simulation was modified to permit failure cases which simulate zero component flow values and (6) the Shuttle SEPS version was modified and secure files were setup on the 1108 and 1110 systems to permit simulation runs to be made from remote terminals															

## TYPICAL CITATION AND ABSTRACT FROM IAA

DATA SPONSORED	DOCUMENT	AI/AA ACCESSION	NUMBER	A79-12869	STUDIES ON THE ERYTHRON AND THE FERROKINETIC RESPONSES IN BEAGLES ADAPTED TO HYPERGRAVITY	AUTHORS	Beckman, J W Evans (California, University, Davis, Calif), and J Oyama (NASA, Ames Research Center, Biomedical Research Div, Moffett Field California, University, Davis, Calif)	AFFILIATION	Ames Research Center, Biomedical Research Div, Moffett Field California, University, Davis, Calif	PUBLICATION	Journal of Applied Physiology, vol 49, Nov 1978, p 1331-1336, 23 refs	DATE	NO NC42 OR180 505	CONTRACT, GRANT OR SPONSORSHIP	Red cell survival ferrokinetics and hematologic parameters were investigated in beagle dogs exposed to chronic hypergravity (2 Gx). Ineffective erythropoiesis, red cell mass, plasma volume, and Cr 51 elution were significantly increased, maximum Fe 59 incorporation was decreased, and there was no change in the mean erythrocyte life span following autologous injection of Cr 51-labeled red cells and Fe 59 labeled transferrin. Red cell count, F(cells), total body hemoglobin (Hb), susceptibility to osmotic lysis, and differential reticulocyte count were increased. White blood cell count venous blood %Hb, mean cell volume, mean cell Hb mean cell Hb concentration, and serum iron were decreased. No changes were observed for body mass, mg Fe per g Hb, iron binding capacity, percent saturation of iron carrying capacity, or the electrophoretic mobility of purified Hb. This study indicated that chronic exposure to hypergravity induced changes in red cell size, volume, total mass, and membrane permeability (Author)
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# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 193)*

MAY 1979

## IAA ENTRIES

**A79-20502** Startle reactions to simulated sonic booms - Influence of habituation, boom level and background noise R Rylander (Goteborg, Universitet, Goteborg, Sweden) and A Dancer (Institut Franco Allemand de Recherches, Saint-Louis, Haut-Rhin, France) *Journal of Sound and Vibration*, vol 61, Nov 22, 1978, p 235-243 13 refs Direction des Recherches et Moyens d'Essais Contract No 75-43-033-00480-75-01

**A79-20621** # Norepinephrine uptake by the isolated heart of rats adapted and deadapted to hypoxia (Zakhvat noradrenalina izolirovannym serdtsem krysa, adaptirovannykh i dizadaptirovannykh k gipoksii) V P Nuzhnyi and A M Alaverdian (I Moskovskii Meditsinskii Institut, Moscow, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 64, Oct 1978, p 1414-1418 12 refs In Russian

**A79-20622** # Regulation and efficiency of sweating in man /Mathematical modeling/ (O regulatsii i effektivnosti potootdeleniia u cheloveka /Issledovanie na matematicheskoi modeli/) I I Ermakova (Akademiia Nauk Ukrainskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR) and K P Ivanov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 64, Oct 1978, p 1419-1425 13 refs In Russian

Results are presented for theoretical studies conducted on a digital model of human thermoregulation. The modeling concerns the situation in which the unique stimulus of eliciting regulatory sweating is the change in cerebral temperature. Transient processes are defined under conditions of different sweating sensitivities to the cerebral temperature change. The study revealed the degree of sensitivity and intensity of sweating necessary to stabilize the core temperature of the body during increases in the ambient temperature. S D

**A79-20623** # Cerebral gas exchange in rats adapted to hypoxia during inspiration of oxygen-poor mixtures (Gazoobmen mozga adaptirovannykh k gipoksii krysa pri vdykhanii obednennykh kislorodom smesei) Z K Vymiatnina (Akademiia Nauk Kirgizskoi SSR, Institut Fiziologii i Eksperimental'noi Patologii Vysokogor'ia, Frunze, Kirgiz SSR, Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 64, Oct 1978, p 1500-1504 18 refs In Russian

**A79-20651** # Cardiac and vascular components of the systemic response of blood circulation to orthostatic influence (Serdechnyi i sosudisty komponenty sistemnoi reaktsii krovoobra-scheniia na ortostaticheskoe vozdeistvie) L I Osadchii (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 64, Nov 1978, p 1592-1600 20 refs In Russian

Orthostatic tests are conducted on anesthetized cats under conditions of extracorporeal circulation (left ventricular bypass). It is found that the orthostatic test produces uniform constrictor responses of the resistive vessels and less uniform constrictor responses of the capacitive vessels, evaluated from the dynamics of blood storage. The response of resistive vessels is eliminated by blocking ganglia of the autonomic nervous system. In case of natural

circulation, ganglionic blocking results in enhanced initial hypotension followed by a decrease in the compensatory rise of arterial pressure while cardiac output remains unchanged. The compensatory response of arterial pressure is due primarily to the vascular component. S D

**A79-20652** # Regional blood supply under hypoxic hypoxia (Regionarnoe krovenapolnenie pri gipoksicheskoi gipoksii) O A Kovalev, V L Larin, V I Severovostokova, S K Sheremetevskaia, and I A Khomutova (Leningradskii Institut Usovshenstvovaniia Vrachei, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 64, Nov 1978, p 1613-1618 20 refs In Russian

Hypoxic hypoxia is produced in unanesthetized male rats (170-220 g) located in a hermetic chamber and breathing a gas mixture containing 10.5% oxygen in nitrogen during 30 and 60 min (moderate hypoxia) and 3.5% oxygen in nitrogen for 30 min (severe hypoxia). It is found that in moderate hypoxia the total volume of circulating blood is increased, while in severe hypoxia it is reduced. Blood release from the liver takes place in moderate hypoxia during 30-min exposure, and it is less pronounced during 60-min exposure and severe hypoxia. In moderate hypoxia, blood redistribution is observed in the myocardium as well as in the muscles and skeletal tissues of the head and neck. Severe hypoxia results in depressed regional blood redistribution and blood storage in the liver, small intestine, colon and testicles. S D

**A79-20653** # Structure of biorhythms as one of the criteria for physiological adaptability of the human organism (Struktura bioritmov kak odin iz kriteriev vozmozhnosti fiziologicheskoi adaptatsii organizma) N I Moiseeva (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 64, Nov 1978, p 1632-1640 18 refs In Russian

A total of 16 normal subjects of different degrees of physiological adaptability to situational and environmental changes is studied. The parameters measured are blood pressure, heart rate, and evaluation of capillaroscopic picture. In addition, the biorhythmic structure of EEG in natural nighttime sleep is analyzed. It is shown that the well-adapting subjects exhibit relatively higher mean values for the parameters studied, a large scatter of these values at different hours of day and night, and a marked temporal structure of the corresponding 24-hr curves. S D

**A79-20654** # Temperature effect of muscular work in the white rat during hypoxia (Temperaturnyi efekt myshechnoi raboty u belykh krysa pri gipoksii) Iu I Bazhenov and N G Lelekov (Akademiia Nauk Kirgizskoi SSR, Institut Fiziologii i Eksperimental'noi Patologii Vysokogor'ia, Frunze, Kirgiz SSR) *Fiziologicheskii Zhurnal SSSR*, vol 64, Nov 1978, p 1648-1654 14 refs In Russian

Experiments are conducted on male white rats (210-260 g) to assess the influence of hypoxia and preliminary hypoxic adaptation on the temperature effect of muscular work. It is shown that compared to the control group, the experimental-group animals exhibit a hypoxic muscular work characterized by increased electrical activity of the working muscles and by a lesser increase in the body and muscle temperatures. Rats adapted to hypoxia are found to manifest a higher level of muscular activity and a lesser increase in temperature effect. This suggests that hypoxia and adaptation to hypoxia decrease the thermoregulatory effect of voluntary muscular activity. S D

**A79-20669 #** Atlas of the dose characteristics of external ionizing radiation /Handbook/ (Atlas dozovykh kharakteristik vneshnego ioniziruiushchego izlucheniia /Spravochnik/) A I Vikhrov, V E Dudkin, E E Kovalev, M M Komochkov, V N Lebedev, E G Litvinova, V G Mitrikas, Iu V Potapov, E L Potemkin, and B S Sychev Moscow, Atomizdat, 1978 60 p 50 refs In Russian

The book contains the basic data on the dose characteristics of ionizing radiation during external radiation The data include the distribution of absorbed and equivalent dose in a tissue-equivalent phantom under standard geometric conditions, the coefficients for transforming from flux density to equivalent dose power, and the effective values of the Q-factor These data are given for gamma-radiation, electrons, muons, pions, protons, neutrons, alpha-particles, and several heavy nuclei for a wide range of energies P T H

**A79-20692 #** Hemodynamic indices under orthostatic and vestibular effects (Pokazатели gemodinamiki pri ortostaticheskikh i vestibuliarnykh vozdeistviakh) V V Usachev, N V Tatarinova, and S L Kantor *Voenno-Meditsinskii Zhurnal*, Oct 1978, p 62-65 13 refs In Russian

Experiments are conducted on 42 normal male subjects (24-35 yr) exposed to orthostatic and vestibular influences A correlation analysis is made of the dependence of hemodynamic shifts on the human capacity to endure Coriolis accelerations The parameters measured are the heart rate, mean blood pressure, differential pulse, stroke volume, cardiac output, and endurance time of Coriolis acceleration The results suggest that the orthostatic test can be regarded as a functional test suitable for identifying individuals with low vestibular-vegetative stability S D

**A79-20756 #** Eye movements and symmetry - Foundations for a quantitative analysis of eye movements as they depend on the structure of the perception field (Blickbewegungen und Symmetrie - Ein Ansatz zur quantitativen Analyse der Blickbewegungen in Abhängigkeit von der Struktur des Wahrnehmungsfeldes) G H Stamm Zurich, Eidgenössische Technische Hochschule, Doktor der Naturwissenschaften Dissertation, 1978 87 p 64 refs In German

The purpose of the work is to provide a framework for experimental investigations of eye movements and their relation to the stimulating field The experimental situation for the case of stationary perception fields is analyzed, and experimental conditions are determined, which will allow an objective evaluation Structured perception fields whose elements are isolated from one another permit unequivocal definition of location-dependent eye-movement parameters Experiments did not detect any dependence of the location-independent eye-movement parameters on symmetry Asymmetry of eye-movement patterns was found to be independent of degree of symmetry of the field The local distribution of saccades was found to be dependent on symmetry of the perception field P T H

**A79-21156** The effects of participatory mode and task workload on the detection of dynamic system failures C D Wickens and C Kessel (Illinois, University, Urbana, Ill) *IEEE Transactions on Systems, Man, and Cybernetics*, vol SMC-9, Jan 1979, p 24-34 34 refs Contract No F44620-76-C-0009

The ability of operators to detect step changes in the order of control dynamics is investigated as a joint function of (a) participatory mode, whether subjects are actively controlling those dynamics or are monitoring an autopilot controlling them, and (b) concurrent task workload Five subjects either tracked or monitored the system dynamics on a two-dimensional pursuit display under single task conditions and concurrently with a 'subcritical' tracking task at two difficulty levels Detection performance was faster and only slightly less accurate in the manual as opposed to the autopilot mode Performance in each mode was derogated by the concurrent tracking requirement, but not by increases in loading task difficulty Further analysis indicated that manual superiority was attributable to the additional proprioceptive information resulting from operator-control adaptation to the system change (Author)

**A79-21242 #** Interaction between hypothalamic and bulbar levels of regulating blood circulation (Vzaimodeistvie mezhdu gipotalamicheskimi i bul'bnymi urovniami regulatsii krovoobrashcheniia) V A Tsybenko and A I Krasnova (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR) *Fiziologicheskii Zhurnal*, vol 24, Nov-Dec 1978, p 729-736 26 refs In Russian

Acute experiments are conducted on anesthetized male and female dogs (8-16 kg) in order to assess the changes in hemodynamic indices during stimulation of different hypothalamic structures before and after deafferentation of reflexogenic zones in the cardiovascular system The parameters measured are blood pressure, heart rate, cardiac output, and total peripheral resistance The results obtained make it possible to set forth the hypothesis of nonidentical differentiated interaction of certain structures of the anterior and posterior hypothalamus with bulbar formations during the regulation of the vascular tone S D

**A79-21243 #** Reliability of determining the cardiac output by the method of quadrupole chest impedance rheography (O nadezhnosti opredeleniia serdechnogo vybrosa metodom tetrapolarnoi grudnoi impedansnoi reografii) M I Gurevich, L D Fesenko, and M M Filippov (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR) *Fiziologicheskii Zhurnal*, vol 24, Nov-Dec 1978, p 849-851 21 refs In Russian

**A79-21244 #** Role of autogenic training in psychophysiological conditioning of aviation school students (Rol' avtogennoi trenirovki v psikhofiziologicheskoi podgotovke kursantov letnykh uchilishch) M M Reshetnikov *Voenno-Meditsinskii Zhurnal*, Nov 1978, p 56-58 7 refs In Russian

The flight capabilities of aviation students with and without autogenic training were compared, and the results indicate the value of the training for suppressing psychological deadaptation, improving flight performance, and increasing receptivity to instruction Approximately 2/3 of the students who heard a lecture on autogenic training expressed a desire to participate in the training, the remaining students served as controls The autogenic training consisted of 3-1/2 months of various forms of autosuggestive encouragement The differences between initial and post instruction pilot capabilities in the two groups are discussed M L

**A79-21245 \*** ST isopotential precordial surface maps in patients with acute myocardial infarction R G Murray, R M Peshock, R W Parkey, F J Bonte, J T Willerson, and C G Blomqvist (Texas, University, Health Science Center, Dallas, Tex) *Journal of Electrocardiology*, vol 12, Jan 1979, p 55-64 40 refs Research supported by the Moss Heart Foundation, Grants No NIH-HL-17669, No NSG-9026

**A79-21246** Clinical importance of directional statistics for electrocardiographic differentiation of smoking habits R Marcuson, K R Berger, W E Powers, R A Bruce, and M J Cowan (Washington, University, Seattle, Wash) *Journal of Electrocardiology*, vol 12, Jan 1979, p 97-102 14 refs NSF Grant No 76-18743, Grants No PHS-MB-00184, No NIH-5-T32-HL-07183

The polarcardiogram (PCG) is known to display the sequential changes in the spatial magnitudes and direction of the heart vector in a spherical coordinate system The study considers the spherical means and standard deviations of the directional components of PCG variables and compares them with the linear means and standard deviations for the same components of these variables in a group of white-collar male (28-62 yr) aerospace workers Normal subjects are classified by smoking status and the presence or absence of CHD It is shown that directional statistics more accurately define the spherical means and variances of heart vectors, thereby permitting more reliable differentiation of directions and angles to aid diagnosis In particular, the heart vector ST reveals a significantly different direction in smokers than in nonsmokers among clinically normal men S D

**A79-21252 # Development of space biology experiments for the Space Shuttle - A student's perspective** S Walker *American Astronautical Society, Anniversary Conference, 25th, Houston, Tex., Oct 30-Nov 2, 1978, Paper 78-134* 9 p 7 refs

Experiments studying the effect of space flight on *Chlorella pyrenoidosa* are reviewed, and the design and development of apparatus used in an experiment on an Astrobee F sounding rocket is described. The prospect of future experiments in a Getaway Special container is indicated. The significance of college students having opportunities to conduct space experiments is considered. M L

**A79-21260 \* # Developing closed life support systems for large space habitats** J M Phillips, A D Harlan, and K C Krumhar (Arizona, University, Tucson, Ariz.) *American Astronautical Society, Anniversary Conference, 25th, Houston, Tex., Oct 30-Nov 2, 1978, Paper 78-145* 34 p 59 refs. Grant No. NSG-2309

In anticipation of possible large-scale, long-duration space missions which may be conducted in the future, NASA has begun to investigate the research and technology development requirements to create life support systems for large space habitats. An analysis suggests the feasibility of a regeneration of food in missions which exceed four years duration. Regeneration of food in space may be justified for missions of shorter duration when large crews must be supported at remote sites such as lunar bases and space manufacturing facilities. It is thought that biological components consisting principally of traditional crop and livestock species will prove to be the most acceptable means of closing the food cycle. A description is presented of the preliminary results of a study of potential biological components for large space habitats. Attention is given to controlled ecosystems, Russian life support system research, controlled-environment agriculture, and the social aspects of the life-support system. G R

**A79-21273 # Health maintenance and health surveillance considerations for an SPS space construction base community** J P Kornberg, P K Chapman, and P E Glaser (Arthur D Little, Inc., Cambridge, Mass.) *American Astronautical Society, Anniversary Conference, 25th, Houston, Tex., Oct 30-Nov 2, 1978, Paper 78-176* 13 p 5 refs

Successful development of the solar power satellite (SPS) would remove the limits to growth imposed by nonrenewable terrestrial energy resources. The requirements for the assembly and maintenance of the SPS are investigated. Construction costs, including transportation of the required construction crew of about 550 people and amortization of the bases, are projected to account for about 8% of the total SPS capital cost. The construction crew's primary activity would be monitoring, servicing, and repairing, with little need for extravehicular activities. It is anticipated that the crew will live and work in the SPS space construction base community, which will be capable of supporting all occupational and nonoccupational activities over extended periods. The most important goal to be met at the construction base is to guarantee the maintenance of the good health of the crew. Appropriate health maintenance and health surveillance activities are discussed. G R

**A79-21404 Engineering-psychological study of information imaging systems** I P Meshcheriakov, V P Sal'nitskii, and A P Nechaev (*Kosmicheskie Issledovaniia*, vol. 16, May-June 1978, p. 453-455) *Cosmic Research*, vol. 16, no. 3, Nov 1978, p. 366-369. Translation

The development of an information model of control processes for manned spacecraft is an important feature of designing the overall system of control. In the present paper, the results are analyzed of a study of the manual control of a docking maneuver, conducted to evaluate various means of obtaining information on the attitude and relative-motion parameters and means of displaying this information to the human operator. V P

**A79-22076 The evolution of the environment and its influence on the evolution of life** E-I Ochiai (British Columbia,

University, Vancouver, Canada). *Origins of Life*, vol. 9, Dec 1978, p. 81-91. 25 refs.

The relation between the redox state of the environment and the availability of elements of biological and prebiological processes is considered for the period of earth's history subsequent to the formation of seas. Changes in the redox state are deduced from paleogeological evidence. An evolutionary sequence of early forms of life is proposed; the determination of this sequence is based on the assumption that the compounds available as a result of thermodynamic and redox relations would dictate some characteristics of the evolving organisms. This evolutionary sequence and the sequence based on protein and polynucleotide analysis are compared. M L

**A79-22077 Synthesis of organic compounds from carbon monoxide and water by UV photolysis.** A Bar-Nun (Tel Aviv University, Tel Aviv, Israel) and H Hartman (Harvard University, Cambridge, Mass.) *Origins of Life*, vol. 9, Dec 1978, p. 93-101. 36 refs

The photolysis of water vapor with carbon monoxide at 1849 Å yields alcohols, aldehydes, and organic acids. The overall quantum yield of the photolysis is 0.033, and it is suggested that this rather high quantum yield could have led to a contribution of approximately 10 to the 11th organic molecules per sq cm per sec to the pool of organic material on the primitive earth. The reactions, initiated by the photolysis of water molecules, produce hydrogen atoms which reduce the CO to a variety of one and two compounds. The organic molecules dissolve in water and are protected from destruction by photolysis. Photolysis of water vapor with CO<sub>2</sub> under similar conditions did not yield organic compounds. M L

**A79-22078 Porphyrin-like compounds genesis under simulated abiotic conditions** C I Simionescu, B C Simionescu, R Mora, and M Leanca (Iasi, Institutul Politehnic, Iasi, Rumania) *Origins of Life*, vol. 9, Dec 1978, p. 103-114. 22 refs

Experiments with gas mixtures intended to simulate the primeval atmosphere of the Earth yielded many biologically important chemicals. Investigations into the synthesis of porphyrin-like compounds from methane, ammonia and water vapour were carried out by using high frequency discharges. Microanalyses of porphyrins showed that porphyrin-like pigments were formed in this way. The presence of divalent cations in the reaction system increased the yield of porphyrin-like pigments also involving the direct synthesis of their metal complexes. The ready formation of these compounds in abiotic conditions is significant, suggesting the possibility of their appearance during the early stage of chemical evolution. (Author)

**A79-22079 Ion-molecule condensation reactions - A mechanism for organic synthesis in ionized reducing atmospheres.** M Meot-Ner (Rockefeller University, New York, N Y.) *Origins of Life*, vol. 9, Dec 1978, p. 115-131. 34 refs. NSF-supported research

Ion-molecule condensation reactions which occur in methane atmospheres containing one or more of H<sub>2</sub>, H<sub>2</sub> + CO, and HCN are reviewed, and new results are presented for ionic condensation reactions which might occur in methane atmospheres containing NH<sub>3</sub> or NH<sub>3</sub> + CO. The reaction kinetics in the density and temperature range of interest of planetary synthesis are examined. Ion-molecule reaction sequences and the identification of major terminal ions in methane atmospheres with traces of H<sub>2</sub>O and NH<sub>3</sub> are considered for the case of an atmosphere resembling Titan's atmosphere (T = 100 K) and for a similar atmosphere with T = 300 K. M L

**A79-22080 Speculations of the evolution of the genetic code** H Hartman (Children's Hospital Medical Center, Boston, Mass.) *Origins of Life*, vol. 9, Dec 1978, p. 133-136

An evolutionary scheme is postulated in which a primitive code, involving only guanine and cytosine, would code for glycine (CG), alanine (CG), arginine (CG) and proline (CC). From each of these amino acids and their codons, there evolves a family of related amino acids as the code expands. The four families are (1) alanine valine,

leucine, isoleucine, phenylalanine, tyrosine, methionine and tryptophane, (2) proline, threonine and serine, (3) arginine, lysine, and histidine, (4) glycine, serine, cysteine, glutamic acid, glutamine, aspartic acid and asparagine. Except for the glycine relation to glutamic acid and aspartic acid, all amino acids are related by chemical similarities in their side chains. Glycine not having a side chain would permit a more complex set of substitutions. (Author)

**A79-22081 Evolution of a genetic code simulated with the computer.** H. Kuhn and C. Kuhn (Max-Planck-Institut für biophysikalische Chemie, Göttingen, West Germany). *Origins of Life*, vol. 9, Dec. 1978, p. 137-150. 15 refs.

A simple selforganizing model system of molecules is considered and it is demonstrated by a computer simulation, that a genetic code of 16 elements (amino acids) can gradually be formed by such a system in the course of many generations. By a number of rare chance events, each suppressing other events of equal a priori probability, a single code results out of an immense number of possible codes of the same a priori probability. The result is discussed in relation to the uniqueness of the genetic code in living systems. The computer simulation emphasizes a particular step in a model pathway discussed elsewhere consisting of many assumed physico-chemical steps leading to a genetic apparatus. (Author)

**A79-22082 Interaction between inositol hexaphosphate and carbobenzoxy peptide - A model for nucleic acid - Nonhistone chromosomal protein interaction.** P. K. Nandi (Central Food Technological Research Institute, Mysore, India). *Origins of Life*, vol. 9, Dec. 1978, p. 151-155. 24 refs.

**A79-22083 \* The Viking biological investigations - Review and status.** H. P. Klein (NASA, Ames Research Center, Moffett Field, Calif.). *Origins of Life*, vol. 9, Dec. 1978, p. 157-160. 27 refs.

The three experimental approaches incorporated into the Viking biology instrument have yielded results that are most readily explained as nonbiological phenomena. The predominant view among investigators trying to simulate the Mars results is that the surface material of Mars contains strongly oxidizing compounds which would account for many of the more intense reactions seen on Mars. Other mechanisms are also currently being proposed and studied. (Author)

**A79-22254 # The European life sciences experiments on-board the first Spacelab mission.** H. Oser (ESA, Paris, France). *Ruimtevaart*, vol. 27, Oct-Dec. 1978, p. 239-257.

The paper describes briefly the purpose, scope, methods and equipment for the life sciences experiments selected for the first Spacelab mission. These include 3-D ballistocardiography, measurement of central venous pressure, serum hormone level determination, electrophysiological tape recorder, vestibular experiments, mass discrimination, lymphocyte proliferation, advanced biostack, and effects of radiation on biological systems. P. T. H.

**A79-22261 # Light flashes in space (Lichtflitsen in de ruimte).** S. L. Bonting (Nijmegen, Universiteit, Nijmegen, Netherlands). *Ruimtevaart*, vol. 27, Oct-Dec. 1978, p. 290-294. In Dutch.

The paper describes an experimental set up and preliminary results on investigations into the possible mechanism of the interaction of cosmic radiation with the visual system, resulting in the 'light flashes' experienced by astronauts during earth orbit or near the moon. It is not clear whether cosmic radiation interacts with the visual pigment, membranes, or with synapses in the retina. The present experiment focuses on the possible interaction with rhodopsin. The radiation effects on a rhodopsin suspension in a cuvette will be studied in terms of the following parameters: characteristic 500-nm absorption, thermal stability, regenerative capacity of rhodopsin, and polyacrylamide-gel electrophoresis of rhodopsin. Instrument requirements for these measurements are discussed. P. T. H.

**A79-22704 The use of aviation pathology and aviation medicine as proof of liability and damage.** W. J. Reals (Kansas, University, Wichita, Kan.) and J. F. Reals (*Annual Air Law Symposium, 12th, Dallas, Tex., Apr. 20-22, 1978*). *Journal of Air Law and Commerce*, vol. 44, no. 2, 1978, p. 297-320. 41 refs.

Reasons for performing a medical and pathological investigation of an aviation accident are discussed, and some areas of concern to aviation pathologists are examined. Environmental factors are considered with reference to altitude and hypoxia, toxins, and alcohol. Procedures for studying the causes and nature of trauma and the possibility of pre-existing disease are surveyed. M. L.

**A79-22771 Contributions of the retina and of the eye optical system to the modulation lowering of the aerial image (Contributions de la rétine et du système optique de l'œil à l'abaissement de la modulation de l'image par double traversée de l'œil).** J. M. Gorrard, O. Dupuy, F. Farfal, M. T. Plantegenest, and S. Slansky (Paris XI, Université, Orsay, Essonne, France). *Journal of Optics*, vol. 9, Nov-Dec. 1978, p. 359-364. 9 refs. In French.

The eye optical system and the retina contribute to the modulation lowering of the image after double passage through the eye. Following the principle of a method allowing to separate their respective contributions, we shall describe the corresponding experimental device. We shall then show that the contribution of the retina to the modulation lowering of the aerial image is large as soon as we leave the fovea. We shall measure the MTF of the eye optical system on the visual axis, and oblique axis. We shall also measure a function which characterizes the retina diffusion. (Author)

**A79-22775 The common occurrence of errors of perceived distance.** W. C. Gogel (California, University, Santa Barbara, Calif.). *Perception and Psychophysics*, vol. 25, no. 1, Jan. 1979, p. 211-21. 21 refs. NSF Grant No. BNS 77 16620.

The effect on the perceived distance of a test object of fixating to a distance different from that of the test object was investigated using monocular observation and two methods for measuring perceived distance. One method, the size adjustment procedure, applying the size-distance invariance hypothesis, measured perceived distance by measuring perceived size. The results from this method were compared with those from a head motion procedure which used the apparent concomitant motion resulting from head motion to measure perceived distance. The results from both procedures indicated that the apparent distance of the test object physically located at a constant distance varied directly as a function of the fixation distance. This occurred despite the presence of texture on the walls and floor of the visual alley. These and other perceptual effects are interpreted as demonstrating that errors in perceived distance (contrary to the theory of direct perception) are a common occurrence in ordinary visual fields. (Author)

**A79-22975 # Vigilance and electroencephalogram.** I. Saito, Y. Kurihara, and Y. Nagasawa (Japan Air Self Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defense Force, Aeromedical Laboratory, Reports*, vol. 19, June 1978, p. 1-10. 24 refs. In English and Japanese.

Three healthy male subjects were instructed to perform tasks of two types, one involving compensatory target tracking, and the other involving discrimination of 800 Hz and 1500 Hz pure tones of 50 msec duration. Combining these two types of tasks produced tasks of four different stages of vigilance. The bipolar vertex left mastoid electroencephalogram was subjected to factor analysis. Factor loading and factor score were calculated for eleven variables by the direct varimax method. The first factor loading correlated with amplitude and slow frequency bands, and the second factor loading had correlation with fast activity. This finding was common to all three subjects, suggesting this will be the fundamental structure of the EEG. It is statistically significant that the second factor score for each second shows the more difficult task to have the lower score. P. T. H.



**A79-23075** Responses of pial arterioles after prolonged hypercapnia and hypoxia in the awake rabbit. J E Leveseur, E P Wei, H A Kontos, and J L Patterson, Jr (Virginia Commonwealth University, Richmond, Va.) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 46, Jan 1979, p 89-95 12 refs Grants No NIH-HL-14251, No DAMD17-74-C-4021

**A79-23427 #** Control of robot manipulators from the modeling of their dynamics (Commande des robots manipulateurs à partir de la modélisation de leur dynamique) J Zabala Iturralde Toulouse III, Université, Docteur de Spécialité E E A Thesis, 1978 156 p 36 refs In French

The thesis is concerned with manipulator control for cases of rapid operational movement. A theoretical method, based on Lagrangian formalism, for studying articulated mechanisms is presented, the analytic results are presented in matrix form to show the relative influence of forces and torques having different physical origins. Implementation of the method by use of a computer is discussed, procedures for obtaining closed loop control so that the terminal part of the manipulator will move in a previously selected manner are examined, and the theory of nonlinear uncoupling is considered. M L

**A79-23464** Object-handling system for manual industry. T Okada (Ministry of International Trade and Industry, Electrotechnical Laboratory, Tokyo, Japan) *IEEE Transactions on Systems, Man, and Cybernetics*, vol SMC-9, Feb 1979, p 79-89 12 refs

An object-handling system for manual industry is described. This system is designed to have a compact structure and to accomplish multiple prehension and flexible motion for manual tasks. The system has three fingers which have structures similar to those of a human. Namely, these fingers are composed of three, four, and four joints, respectively, and can perform not only such simple motions as bending and extending but also such lateral flexing motions as adduction and abduction. The kinematics of the system is discussed in a rectangular coordinate system. The general solution for the finger joint is obtained by solving a fourth-degree equation. The control mode of each finger joint is suitably changed between position and torque control, and each joint is controlled by a hardware servo system. Cooperative motions among the fingers are easily realized by means of the hardware servo system. In an experiment of swing motion, cooperative motion based on a force control is accomplished between the right and left fingers without dropping the object. Bar turning and sphere turning are accomplished smoothly by a computer control in which control signals for finger joints are generated by interpolating a sequence of set points that has been stored in the computer in the teaching process. (Author)

**A79-23466** Morbidity experience of air traffic control personnel - 1967-77. C F Booze (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 1-8 9 refs

The morbidity experience of 28,086 air traffic controller (ATC) personnel has been examined for the time period 1967-1977, with particular attention to potential effects of job demands on ATC health. It is found that hypertension and psychoneurotic disorders are the most frequently occurring new diseases among ATC personnel. For ages below 30 yr, cardiovascular and visual problems are the most frequently observed existing conditions among ATC personnel, between ages 30-49, abdominal then cardiovascular diseases are the most frequent conditions, for ages 50 and above, cardiovascular disease is the most common, followed by abdominal diseases. A lack of association between disease occurrence and occupation is observed in the data correlating disease occurrence with length of service and age. Substantial increase in disease incidence is noticed after second-career legislation was implemented. Job and salary protection considerations obviously explain some of the differences. S D

**A79-23467** Hemoglobinemia in rats exposed to high altitude is not due to an overload of catabolic mechanisms. R P Smith, R Kruszyna, and L C Ou (Dartmouth College, Hanover, N H) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 9-13 10 refs Grants No NIH 14127, No NIH 21159

Male and female Sprague Dawley rats (200-250 g) were exposed continuously to a simulated altitude of 5490 m in large low-pressure chambers for 7 days. The study assesses the effect of splenectomy on high-altitude hemoglobinemia, along with an attempt to duplicate hemoglobinemia by acute hypertransfusion and by chronic administration of cobalt. The results suggest that hemoglobinemia of altitude exposure is not due to a stress on the hemoglobin catabolic reserve. Both altitude exposure and chronic cobalt treatment resulted in increases in red cell 2,3-DPG, decreases in body weight, and splenic hypertrophy. Although altitude and cobalt had similar effects with respect to erythropoiesis, red cell 2,3-DPG, and various organ/body weight ratios, the effects of cobalt appeared to be independent of sex, whereas the altitude-induced changes were significantly correlated with sex. S D

**A79-23468** Stereological ultrastructural analysis of the axonal endings in the neuromuscular junction of rats after a flight on biosputnik 782. S Baranski and M Marciniak (Akademia Medyczna, Warsaw, Poland) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 14-17 16 refs

The study was aimed at quantitative and qualitative evaluation of the axonal endings of the neuromuscular junction in the quadriceps femoris muscle and the diaphragm in animals after a space flight. Quantitative morphometric studies at the ultrastructural level demonstrated a statistically significant diminution of the mean number of mitochondria and synaptic vesicles on the cross section of the axonal endings. Qualitative analysis of electronograms revealed morphological changes indicating degeneration and various degrees of injury in some of the axonal endings of the neuromuscular junctions. (Author)

**A79-23469** Effect of alcohol and marijuana on eye movements. R W Baloh, R Griffith (California, University, Los Angeles, Calif.), S Sharma, and H Moskowitz (Southern California Research Institute, Los Angeles, Calif.) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 18-23 30 refs Alcohol, Drug Abuse, and Mental Health Administration Grant No AA 00251, Grant No NIH-NS-09823

Electrooculographic recordings in 24 normal subjects (21-29 yr), given alcohol and marijuana (tetrahydrocannabinol, THC) alone and in different combinations, are examined for quantitative evaluation of the effects of alcohol and THC on saccades, smooth pursuit, and optokinetic nystagmus. It is shown that alcohol (0.05 and 0.1%) alone produced significant (p less than 0.05) impairment of saccade maximum velocity and reaction time, smooth pursuit velocity, and optokinetic slow-component velocity. Although additive effects of combined use of alcohol and THC on the performance of eye tracking tests are demonstrated, the effect of moderate doses of alcohol overshadows that of THC. S D

**A79-23470 \*** Cardiovascular regulatory response to lower body negative pressure following blood volume loss. M Shimizu, D N Ghista, and H Sandler (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 24-33 26 refs

An attempt is made to explain the cardiovascular regulatory responses to lower body negative pressure (LBNP) stress, both in the absence of and following blood or plasma volume loss, the latter being factors regularly observed with short- or long-term recumbency or weightlessness and associated with resulting cardiovascular deconditioning. Analytical expressions are derived for the responses of mean venous pressure and blood volume pooled in the lower body due to LBNP. An analysis is presented for determining the HR change due to LBNP stress following blood volume loss. It is concluded that the reduced orthostatic tolerance following long-term

space flight or recumbency can be mainly attributed to blood volume loss, and that the associated cardiovascular responses characterizing this orthostatic intolerance is elicited by the associated central venous pressure response S D

**A79-23471 Correlation of choice reaction time performance with biorhythmic criticality and cycle phase** J H Wolcott, C A Hanson, W D Foster, and T Kay (US Army, Armed Forces Institute of Pathology, Washington, D C) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 34-39 9 refs

The biorhythm theory is tested by a method whereby actual performance of a laboratory task is correlated with the phases of the biorhythm cycle. Performance is measured in a choice reaction time (CRT) with each task composed of 400 light flashes. Ten individuals (18-42 yr) are assigned to perform a total of 644 CRT tasks at seven pressure levels: ambient, 706.6, 656.3, 609.0, 564.4, 522.6, and 483.3 mm Hg, corresponding to altitudes of 60, 610, 1219, 1829, 2438, 3048, and 3658 m. The results are discussed relative to distribution of CRT performance tasks over phases of the biorhythm cycles, and to analysis of performance over the combined phases of the three biorhythm cycles (physical, emotional, and intellectual). It is shown that performance in the CRT task is not influenced by biorhythms. More importantly, one is more likely to perform better on a critical day, although the overall probability of this occurrence is not statistically significant S D

**A79-23472 Carbon monoxide and human time discrimination - Failure to replicate Beard-Wertheim experiments** D A Otto, V A Benigus, and J D Prah (US Environment Protection Agency, Chapel Hill, N C) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 40-43 23 refs

A study was conducted to more precisely replicate the Beard-Wertheim (1967) experiment which described a dose-related deficit in human time perception during low-level CO exposure. In the present study, thirteen human male subjects (19-30 yr, mean age 22.9 yr), nonsmokers for at least 6 months prior to the experiment, were seated in an armchair in a dimly lit audiometric chamber in which CO was injected and controlled after exposure, and COHb was determined by the Radford (1971) spectrophotometric method. Exposure levels were 0, 75, and 150 ppm, and duration of exposure was 2.33 hr. The time discrimination task consisted of a two-tone duration judgment in which a standard 1-sec tone was followed after 0.5 sec by a second comparison tone of variable duration. The study failed to obtain any CO-related deficit in human time perception, thereby refuting any adverse effect of low-level CO exposure on time perception in healthy young adults S D

**A79-23473 Application of a bubble formation model to decompression sickness in rats and humans** D E Yount (Hawaii, University, Honolulu, Hawaii) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 44-50 30 refs. Contracts No. NOAA 04-6 158-44114, No. NOAA 04-7-148-44129

**A79-23474 Thermal sweat rate response to an acute short exposure at a simulated altitude of 4,600 m** Y Houdas, J L LeCroart, C Ledru, and G Carette (Lille II, University, Lille, France) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 60-62 15 refs

**A79-23475 Incapacitation time for +Gz-induced loss of consciousness** J E Whinnery and R M Shaffstall (USAF, School of Aerospace Medicine, Brooks AFB, Tex) *Aviation, Space, and Environmental Medicine*, vol 50, Jan 1979, p 83-85 13 refs

The paper reports on the experience of the USAF School of Aerospace Medicine, Crew Technology Division, in +Gz-induced loss of consciousness (LOC) as documented on its human centrifuge. The time of incapacitation is defined as the time from loss of visual or verbal response by the subject to the return of visual or verbal response by the subject. The videotape of each LOC episode is viewed independently by the investigators several times and the time

of incapacitation tabulated. It is found that the overall mean time of incapacitation of 25 subjects who experienced LOC during centrifugation is 15.0 sec with a range from 9.0 to 20.5 sec. Much of the time, as observed during a rapid +Gz onset run, blackout and LOC occur simultaneously. However, an episode of G-induced LOC may not be recognized by the subject. It is suggested that pilots should experience greyout and blackout in a controlled environment so that they will become familiar with their own specific G tolerance limits and protective straining ability S D

**A79-23584 The next decade - Development, training, supervision** L D Parrish (FAA, Air Traffic Div., Atlanta, Ga.) In *Air Traffic Control Association, Annual Fall Conference*, 23rd, Fort Worth, Tex., October 2-5, 1978, Proceedings. Washington, D C, Air Traffic Control Association, Inc., 1978, p 54-60

Some aspects of ATC system development are reviewed and consideration is given to academy training, and OJT and facility development training of controllers. Some characteristics of ATC supervision and organization are briefly considered B J

**A79-23596 A controller's eye view of color** G C Kinney (Mitre Corp., Metrek Div., McLean, Va.) In *Air Traffic Control Association, Annual Fall Conference*, 23rd, Fort Worth, Tex., October 2-5, 1978, Proceedings. Washington, D C, Air Traffic Control Association, Inc., 1978, p 216-226 7 refs

Four questions about ATC displays are addressed: (1) would adding colors improve or degrade controller performance, (2) how might colors be used to improve system safety, increase productivity, and reduce stress and fatigue, (3) which colors are suitable, and (4) what information is required to answer these questions. Since there is no field experience with colors in ATC displays, answers to these questions were sought in the literature B J

**A79-23782 Modeling heat transfer through human skin subjected to high external temperatures** R H Foglesong and D W Deal (USAF, Washington, D C) In *Modeling and simulation Volume 9 - Proceedings of the Ninth Annual Pittsburgh Conference*, Pittsburgh, Pa., April 27, 28, 1978. Part 1. Pittsburgh, Pa., Instrument Society of America, 1978, p 339-343 6 refs

A subjective discussion of heat transfer through human skin subjected to a high surface temperature (above 47°C) is presented. A mathematical model involving an unsteady state solution to a partial differential equation descriptive of the conductive process is included. When skin is subjected to very high temperatures, most of the biological cooling processes that regulate the skin's temperature are negligible, since these processes are only capable of controlling skin temperatures over a very small range. When this simplification is applied to the proposed mathematical model, a relatively straightforward solution to a classical heat transfer conduction problem results. A discussion of the boundary conditions selected as appropriate for this model is included. (Author)

**A79-23783 Linearization and sensitivity analysis of model for human eye movements** J R Latimer (Carnegie Mellon University, Pittsburgh, Pa.), B T Troost (US Veterans Administration Hospital, Washington, D C), and A T Bahill (Pittsburgh, University, Pittsburgh, Pa.) In *Modeling and simulation Volume 9 - Proceedings of the Ninth Annual Pittsburgh Conference*, Pittsburgh, Pa., April 27, 28, 1978. Part 1. Pittsburgh, Pa., Instrument Society of America, 1978, p 365-371 7 refs. NSF Grant No. ENG-77 22418

One of the best models for the human eye system is the sixth order nonlinear reciprocal innervation model. In order to use computerized analysis and validation programs, this model was linearized and transformed into state variable notation. The first step in evaluating the effects of this linearization was a sensitivity analysis of the model. (Author)

**A79-23792 Visual cues in manual tracking of simulated targets.** A R Ephrath and J Korn (Connecticut, University, Storrs, Conn.) In *Modeling and simulation Volume 9 - Proceedings of the Ninth Annual Pittsburgh Conference*, Pittsburgh, Pa., April 27, 28, 1978 Part 3 Pittsburgh, Pa., Instrument Society of America, 1978, p 1111-1115

The effects of visual cues inherent in a moving target image (aspect ratio, size, etc.) on performance in a simulated compensatory tracking task are explored experimentally. In this study, seven well trained subjects tracked a computer-generated image of a ground-to-air AAA target under two experimental conditions: 'With Visual Cues', where aspect angle and range cues (size) were present, and 'No Visual Cues', where the target image retained a fixed size and shape. Differences in performance under the two conditions are explored via statistical tests. Explanation of the underlying mechanism is attempted by appealing to the Optimal Control Model.

(Author)

**A79-23881 Responses of teachers to aircraft noise.** N W M Ko (University of Hong Kong, Hong Kong). *Journal of Sound and Vibration*, vol 62, Jan 22, 1979, p 277-292 18 refs

Acoustic measurements of aircraft noise in 139 schools in Hong Kong have been carried out. The schools are located under and very near the flight-paths of aircraft coming in and leaving the international airport, Kai Tak. Coupled with the acoustic measurements, measurements of the subjective responses to this aircraft noise of 2100 Chinese teachers in these schools have been made. It is found that the subjective responses of the teachers correlate well with the Noise and Number Index. Besides the effect of annoyance, it is further found that the more serious effect of aircraft noise is the disruption of verbal communication, resulting in speech and teaching interference during lessons.

(Author)

**A79-23951 Mitral prolapse and acceleration (Prolapsus mitral et accélération).** C Leguay, A Seigneure (Hôpital d'Instruction des Armées Dominique Larrey, Versailles, France), J Droniou, J Duret, and J Pernod (Hôpital d'Instruction des Armées Percy, Clamart, Hauts-de-Seine, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol 17, 3rd Quarter, 1978, p 229-235. In French.

The effects of acceleration on the mitral apparatus are discussed. Accelerations in the x direction are able to cause a mitral prolapse by direct mechanical action. Accelerations in the z direction can damage the submitral apparatus indirectly as a result of subendocardial hemorrhages or acceleration cardiomyopathies. The use of echocardiography to detect mitral damage in pilots is considered.

M L

**A79-23952 Visual acuity with regard to simultaneous colored contrast on a television screen - Results (Acuité visuelle en contraste coloré simultané sur écran de télévision - Résultats).** G F Santucci and C Valot (Centre de Recherches de Médecine Aéronautique, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol 17, 3rd Quarter, 1978, p 237-243. In French.

Subjects were briefly presented a colored optotype surrounded by background color on a television screen and were asked to indicate the orientation of the optotype. The delays in response time for different combinations of colors were determined, and a statistical analysis using Snedecor's F was applied. Information on the effects caused by using colors either as foreground or as background is presented. It is found that combinations using blue or red permit the highest visual acuity.

M L

**A79-23953 Cardiac reactions in tests on the wearing of the Yankee Escape System harness during minus G accelerations in the z direction (Réactions cardiaques au cours des essais de tenue du harnais du Yankee Escape System sous accélérations moins Gz).** B Vettes and J L Poirier (Centre d'Essais en Vol Laboratoire de

Médecine Aéronautique, Brétigny-sur-Orge, Essonne, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol 17, 3rd Quarter, 1978, p 245-250. In French.

The ability of a human subject wearing a Yankee Escape System harness to withstand -3 and -4 G accelerations in the z direction was studied by measuring physical and physiological parameters. The harness system is described, and the placement of electrodes for obtaining an EKG is considered. Physical displacement was determined from films. The subject tolerated -3 G without difficulty but required that -4 G acceleration be terminated. Difficulties in obtaining good EKG data are reported.

M L

**A79-23954 Choice and techniques of analysis of indices for the perception of visual information III (Choix et techniques d'analyse d'indices de la prise d'informations visuelles III).** M Neboit, A Pottier (Organisme National de Sécurité Routière, Laboratoire de Psychologie Autodrome, Montlhéry, Essonne, France), J P Papin, J P Puimean-Chieze, and D Viard (Centre de Recherches de Médecine Aéronautique, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol 17, 3rd Quarter, 1978, p 251-254. 11 refs. In French.

Oculomotor strategies used by pilots with and without ILS are considered with reference to pilot training and experience. Strategies were studied during Transall-simulated landings. The experimental procedure is discussed with attention to experimental difficulties. The significance of different lengths of time of attention to instruments is considered.

M L

**A79-23955 Conduction difficulties of vagal origin in flight personnel - Significance of intrathoracic data on the bundle of His (Troubles de la conduction d'origine vagale dans le personnel navigant - Intérêt de l'enregistrement endocavitaire du faisceau de His).** G Leguay, A Seigneure (Hôpital d'Instruction des Armées Dominique Larrey, Versailles, France), J C Duret, J Droniou (Hôpital d'Instruction des Armées Percy, Clamart, Hauts-de-Seine, France), B Vettes (Centre d'Essais en Vol, Laboratoire de Médecine Aéronautique, Brétigny-sur-Orge, Essonne, France), and J Pernod (Hôpital d'Instruction des Armées Percy, Clamart, Hauts-de-Seine, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol 17, 3rd Quarter, 1978, p 255-261. In French.

The procedure used for placing a probe near the bundle of His is described, and evidence obtained by use of the probe, as well as data from pharmacodynamic tests and stimulation tests, demonstrate the possible existence of supra-Hisian conduction problems of vagal origin in flight personnel. The problems, which are functional and reversible, are similar to problems occurring in athletes. Stress testing can determine whether the conduction problem should disqualify an individual from continuing flight responsibilities.

M L

**A79-23956 Pneumothorax and flight personnel (Pneumothorax et personnel navigant).** G Leguay, A Seigneure, F Fabresse (Hôpital d'Instruction des Armées Dominique Larrey, Versailles, France), and J Droniou (Hôpital d'Instruction des Armées Percy, Clamart, Hauts-de-Seine, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol 17, 3rd Quarter, 1978, p 264-268. In French.

Factors involved in the incidence, etiology, and therapeutic treatment of pneumothorax among flight personnel are surveyed. Seasonal, circadian, and aeronautic factors affecting the incidence are examined, and the tendency of other disabilities to increase the likelihood of the disorder is considered. Medical decisions involved in treatment and reintegration of flight personnel in their professional responsibilities are outlined.

M L

**A79-23957 Psychosis in air force flight personnel during the last 25 years (La psychose chez les membres du P.N. de l'armée de l'air au cours des 25 dernières années).** J-C Hadni, J-R Galle-Tessonneau, and B Ryckelynck (Service de Santé des Armées, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol 17, 3rd Quarter, 1978, p 269, 270. In French.

Twenty-four cases of acute psychosis and 19 cases of chronic psychosis diagnosed in French air force personnel have been detected during the period 1952-1977, and the incidence of psychosis and the reinstatement of these personnel is considered with reference to the practice in the US and in Britain. The question of whether psychosis is responsible for aircraft accidents is considered. Causes of flight personnel psychoses, when determined, and the relation of psychosis to suicide attempts are briefly examined. M L

**A79-23958** A new case of autochthonous malaria in the Paris region associated with frequentation of airports - Recommendations of prophylactic procedures (Un nouveau cas de paludisme autochtone en région parisienne en rapport avec la fréquentation des aéroports - Recommandations prophylactiques) P. Saliou, B. Vergeau, H. Essioux, and C. Laverdant (Hôpital d'Instruction des Armées Begin, Saint-Mande, Val-de-Marne, France) *Médecine Aéro-nautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 17, 3rd Quarter, 1978, p. 271, 272. 8 refs. In French.

**A79-23959** The value of measuring ocular tonus as a test for detecting glaucoma in flight personnel (Valeur de la mesure du tonus oculaire comme test de dépistage du glaucome chez le personnel navigant) P. J. Manent, L. Serre, M. Maille (Hôpital d'Instruction des Armées Dominique Larrey, Versailles, France), and P. Maucourt (Service de Santé, Ecole d'Application, Paris, France) *Médecine Aéro-nautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 17, 3rd Quarter, 1978, p. 273-275. In French.

The paper is concerned with the need for tests in addition to the measurement of ocular tonus for the early detection of glaucoma in flight personnel. While ocular hypertony is the primary indication of early glaucoma, reliance on this test only leads to the possibility of false-negatives in a number of cases. It is suggested that ocular variations or interocular differences should be determined and that provocation tests should be conducted. A case study is presented.

M L

**A79-23960** Relations between research and instruction in physiology and aerospace ergonomics in the military health services (Relations entre la recherche et l'enseignement de la physiologie et l'ergonomie aérospatiales au sein du service de santé des armées) J. Timbal (Centre de Recherches de Médecine Aeronautique, Laboratoire Central de Biologie Aeronautique, Paris, France) *Médecine Aéro-nautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 17, 3rd Quarter, 1978, p. 276-280. In French.

The history of military health research is briefly examined, and research topics of current interest are discussed. The contribution of the research program to the development of course content in the military instruction program is considered, and it is pointed out that the subject matter does not remain fixed on classic topics but evolves as research clarifies fresh areas of importance. The problem of a nonspecialist incorporating the ideas of a specialist into course work is considered. M L

**A79-24065** Primate cone sensitivity to flicker during light and dark adaptation as indicated by the foveal local electroretinogram W. S. Baron, D. van Norren (SRI International, Menlo Park, Calif.), and R. M. Boynton (California, University, La Jolla, Calif.) *Vision Research*, vol. 19, no. 2, 1979, p. 109-116. 50 refs. Research supported by the Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek, Grants No. NIH-EY 05179, No. NIH-EY-01541.

**A79-24066** The equivalent background and retinal eccentricity L. Spillmann and K. Fuld (Neurologische Universitätsklinik, Freiburg im Breisgau, West Germany) *Vision Research*, vol. 19, no. 2, 1979, p. 117-122. 30 refs. Deutsche Forschungsgemeinschaft Contract No. SFB-70.

An experimental study was conducted to determine whether a single equivalent background curve could be obtained if retinal

eccentricity were used as a parameter. Such a curve would describe the time course of dark adaptation from the fovea to the periphery regardless of local threshold differences. Dark thresholds and increment thresholds were determined in two subjects at a total of eight retinal loci. Data adaptation and increment threshold curves were plotted for two different monochromatic test field conditions. The data show that there is no common equivalent background governing dark adaptation all across the retina; instead, they suggest that the time course of the equivalent background is specific for each location tested. Photopic and scotopic visions are found to exhibit opposite behaviors as to the equivalent background for the inner and outer peripheries. The findings indicate that the equivalent background holds only for loci having comparable spatial and temporal properties. S D

**A79-24067** Factors controlling the competing sensations produced by a bistable stroboscopic motion display J. T. Petersik and A. Pantle (Miami University, Oxford, Ohio) *Vision Research*, vol. 19, no. 2, 1979, p. 143-154. 19 refs. Contract No. F33615-74-C-4032.

Two competitive sensations which are produced by a previously described bistable stroboscopic movement display were studied in a series of five experiments. In Experiment 1 each of the movement sensations was selectively adapted, a finding which supports the hypothesis that a different visual process underlies each of the two sensations. In Experiments 2-5 the relative dominance of the two sensations was controlled by the manipulation of five physical stimulus variables - frame duration, duration of the interval between frames, luminance of the interval between frames, contrast of stimulus frames, and degree of dark adaptation. Limiting conditions for the processes mediating the two competitive sensations were elaborated, and the implications of the findings for other studies of stroboscopic movement discussed. (Author)

**A79-24068** Contrast effects on smooth-pursuit eye movement velocity G. Haegerstrom-Portnoy and B. Brown (Smith-Kettlewell Institute of Visual Sciences, San Francisco, Calif.) *Vision Research*, vol. 19, no. 2, 1979, p. 169-174. 9 refs. Research supported by the Smith-Kettlewell Eye Research Foundation, Grants No. NIH-5-S01-RR-05566, No. NIH-5-P30-EY-01186.

These experiments show that the smooth-pursuit system responds to changes in contrast in a similar way to the known response of direction-specific mechanisms, suggesting that the smooth pursuit system uses the signal generated by these mechanisms. Smooth pursuit eye movement velocity and saccadic latency were measured as a function of target contrast in two experiments using ramp target motion between 5 and 40 deg/sec. In the first experiment, the target velocity was predictable; in the second, it was unpredictable. Smooth pursuit eye velocity in response to predictable ramp targets was independent of target contrast. Saccadic latency decreased dramatically as contrast increased. However, eye velocity in response to unpredictable ramp targets increased with increasing target contrast over a narrow range of contrast (0.3 log units) above contrast threshold and then the response saturated. (Author)

**A79-24069** The perceived direction of the binocular image J. E. Sheedy and G. A. Fry (Ohio State University, Columbus, Ohio) *Vision Research*, vol. 19, no. 2, 1979, p. 201-211. 13 refs.

Despite small disparities between the two retinal images of an object, they may be perceived as a single binocular image. The aim of this study is to determine the direction in which this single binocular image is seen relative to where the monocular images would be seen if seen separately. The psychophysical data show that the single binocular image is seen between where the two monocular images would be seen. The perceived direction of the binocular image is closer to that of one monocular image than that of the other for some subjects. This is a form of ocular dominance. Differently colored monocular stimuli also result in an intermediately perceived binocular image, however, the disparity range over which fusion may be obtained is reduced. The data are consistent with a fusion theory of binocular vision. (Author)

**A79-24419 #** The time parameter in exposures to microwave radiation (Parametr vremeni pri mikrovolnovom obluchenii) B I Davydov, V V Antipov, and V S Tikhonchuk *Kosmicheskie Issledovaniia*, vol 17, Jan-Feb 1979, p 151-158 19 refs In Russian

The time factor of radiation damage and recovery is studied in tests with 3080 mice and 604 rats, and the results of exposure to microwave and ionizing radiation are compared The comparison points to the existence of numerous common traits of these two types of radiation, particularly in recovery, cumulation (adaptation), and evaluation of the damage as a function of the dose V P

**A79-24513** The effect of plasmoidal slime on the metabolism of haploid cells of *Physarum flavicomum* and the respiration of isolated mitochondria M Asgari and H R Henney, Jr (Houston, University, Houston, Tex ) *Cytobiologie*, vol 16, 1978, p 345-357 23 refs

**A79-24519** The physical appearance of intelligent aliens N J Spall *British Interplanetary Society, Journal (Interstellar Studies)*, vol 32, Mar 1979, p 99-102 7 refs

It is argued that any intelligent life across the Galaxy will have evolved into a basically humanoid form, mainly on the basis of the morphological characteristics that are a necessary condition for evolution of intelligence The basic assumption is that only life based on carbon compounds forming in water on planets with broadly earth-like conditions can evolve The argumentation is along the following lines, for example birds do not possess large enough brains for conceptualization for they must be light in weight in order to fly All intelligent conceptualizing creatures in the Galaxy, it is argued, have their origins in predatory animals P T H

**A79-24520** Photochemical synthesis of amino acids from aqueous solutions of ethyl alcohol, ammonia/nitrogen under varied conditions C K Pathak, J N Pant, and H D Pathak (Kumaun University, Naini Tal, India) *British Interplanetary Society, Journal (Interstellar Studies)*, vol 32, Mar 1979, p 103-106 20 refs Research supported by the Kumaun University

Irradiation of aqueous sterilized solutions of ethyl alcohol and ammonia with UV light from a low pressure quartz Hg vapor lamp (250 W, 253.7 nm) revealed the formation of lysine, aspartic acid, glycine, glutamic acid, threonine, alpha-alanine, n-aminobutyric acid, valine and leucine Amino acid synthesis was accelerated in the presence of titanium oxide and zirconium oxide Identical irradiation experiments carried out with an ethyl alcohol, nitrogen and water system, for 30 hours, resulted in the formation of a similar range of photoproducts with lower yield, whereas irradiation of aqueous ethyl alcohol in the presence of a mixture of nitrogen and hydrogen increased the yield as well as the number of photoproducts Synthesis of biomolecules from alcohols under prebiotic earth conditions may throw some light on the process of chemical evolution (Author)

## STAR ENTRIES

**N79-16510** Rutgers - The State Univ New Brunswick N J  
**A STUDY OF CEREBRAL BLOOD FLOW IN THE GOAT  
 A CORRELATIONS BETWEEN THE VENTILATORY AND  
 CEREBROVASCULAR RESPONSES TO CARBON MONOX-  
 IDE INHALATION B THE DYNAMICS OF THE CEREBRAL  
 BLOOD FLOW RESPONSE TO HYPOXIA BY FREQUENCY  
 RESPONSE ANALYSIS** Ph D Thesis

Dennis Delmar Doblar 1978 145 p  
 Avail Univ Microfilms Order No 7901251

The cerebrovascular control system was studied as it responded to changes in oxygenation of arterial blood. Two separate studies were undertaken to determine the relationship between cerebral blood flow (CBF) and the ventilatory responses to carbon monoxide inhalation and to study the dynamic characteristics of the CBF response to hypoxic hypoxia with fixed ventilatory parameters. Simultaneous measurements were made of carboxyhemoglobin levels in arterial blood, ventilation, CBF, O<sub>2</sub> delivery to the brain, and O<sub>2</sub> tension in cerebral venous blood during inhalation of 1% CO in 40% O<sub>2</sub> by six unanesthetized goats. Dissert Abstr

**N79-16511** Kansas Univ Lawrence  
**THE EFFECT OF HYPEROXIA ON CEREBRAL BLOOD FLOW  
 IN THE UNANESTHETIZED PONY** Ph D Thesis

David William Busija 1978 75 p  
 Avail Univ Microfilms Order No 7824779

Previous studies on unanesthetized ponies provide indirect evidence that cerebral blood flow (CBF) decreases during moderate hyperoxia (40% O<sub>2</sub> in N<sub>2</sub>). Experiments were designed to directly measure CBF during 2 levels of normocanic hyperoxia. Cerebral blood flow, the acid-base status of cerebrospinal fluid (CSF) and arterial blood ventilation and hemodynamics were measured in 13 unanesthetized ponies during the following conditions: (1) control breathing room air (PB = 738 mm Hg), (2) after 60 minutes of breathing 40% O<sub>2</sub> in N<sub>2</sub>, and (3) following an additional 60 minutes of breathing 100% O<sub>2</sub> with sufficient CO<sub>2</sub> (2.2 to 4.5%) added to the inspired gas to maintain the partial pressure of CO<sub>2</sub> in the arterial blood (PaCO<sub>2</sub>) at the control level. Cerebral blood flow and cardiac output were measured using radioactive microspheres 15 microns in diameter labeled with <sup>46</sup>Sc, <sup>125</sup>I, <sup>65</sup>Sr and <sup>153</sup>Gd. Cerebrospinal fluid pH and PCO<sub>2</sub> and pHa, PaCO<sub>2</sub> and PaO<sub>2</sub> were measured using conventional radiometer electrodes. Dissert Abstr

**N79-16512\*** Lockheed Electronics Co Houston Tex Systems and Services Div

**METEOROLOGICAL LIMITS ON THE GROWTH AND  
 DEVELOPMENT OF SCREWORM POPULATIONS**

D E Phinney and G K Arp Oct 1978 26 p refs  
 (Contract NAS9-12200)  
 (NASA-CR-151873, LEC-12395, JSC-14576) Avail NTIS  
 HC A03/MF A01 CSCL 06C

A program to evaluate the use of remotely sensed data as an additional tool in existing and projected efforts to eradicate the screwworm began in 1973. Estimating weather conditions by use of remotely sensed data was part of the study. Next, the effect of weather on screwworm populations was modeled. A significant portion of the variation in screwworm population growth and development has been traced to weather-related parameters. This report deals with the salient points of the weather and the screwworm population interaction. Author

**N79-16513#** Los Angeles State and County Arboretum Arcadia, Calif

**MECHANISM OF PLANT VIRUS INACTIVATION IN SOIL**

**INJECTED WITH MUNICIPAL WASTEWATER AND TREAT-  
 MENT PLANT SLUDGES** Intern Report, Dec 1977 - Jun 1978

P C Cheo 1978 36 p  
 (Grant NSF ENV-76-82743)  
 (PB-287012/9 NSF/RA-780251) Avail NTIS  
 HC A03/MF A01 CSCL 06M

The fact that microbiological factors can degrade TMV in a soil environment was established by laboratory experiments. Biological assay of isolates from soil using the autoclaved soil vial system has indicated that the majority of bacteria isolates do not show any activity. Several isolates however show a positive response in such a complex and noncriterion system. An alternate medium for the bacteria-TMV interaction assay system is presently being developed. Glass beads in the size range of 0.2 mm and 0.11 mm in diameter and silica sand 30 and 60 mesh are being tested as possible replacement for the autoclaved soil-vial system. Preliminary data indicate that the biological factor in soil responsible for TMV degradation can be determined using the glass beads system. GRA

**N79-16514#** Joint Publications Research Service, Arlington Va

**SPACE BIOLOGY AND AEROSPACE MEDICINE,  
 VOLUME 13, NO 1, 1979**

14 Feb 1979 113 p refs Transl into ENGLISH from Kosm Biol i Aviakosm Med. (Moscow) no 1, 1979 p 3-75  
 (JPRS-72826) Avail NTIS HC A06/MF A01

Human and animal physiological responses to space flight stress were studied.

**N79-16515#** Joint Publications Research Service Arlington, Va

**EFFECT OF 49-DAY SPACE FLIGHT ON PARAMETERS OF  
 IMMUNOLOGICAL REACTIVITY AND PROTEIN COMPOSI-  
 TION OF BLOOD IN THE CREW OF SALYUT 5** c52

Ye V Guseva and R Yu Tashpulatov In its Space Biol and Aerospace Med Vol 13 No 1 1979 (JPRS-72826) 14 Feb 1979 p 1-7 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med. no 1 (Moscow) 1979 p 1-7

Avail NTIS HC A06/MF A01

The prolonged 49-day space flight resulted in a significant inhibition of immunological reactivity of the Salyut-5 crewmembers which involved a decline in bactericidal activity of the serum and lysozyme activity of the saliva and a decrease in the content of immunoglobulins in the saliva and tonsillary lacunae. After the flight recovery of reduced immunoreactivity took a longer time than after shorter-term flights. The prolonged space mission led to an increase of most globulin fractions and a decrease of albumin in blood. With respect to globulin fractions, a predominant increase in the content of C sub 3c and C sub 4 factors of the complement and immunoglobulins G A, M was noted. Blood proteins returned to the normal within a long period of time. Author

**N79-16516#** Joint Publications Research Service Arlington, Va

**EFFECTS OF SPACE FLIGHT ON COURSE OF RADIATION  
 LESIONS IN RAT LYMPHOID ORGANS**

G N Durnova A S Kaplanskiy and V V Portugalov In its Space Biol and Aerospace Med Vol 13 No 1 1979 (JPRS-72826) 14 Feb 1979 p 8-11 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med No 1, (Moscow) 1979 p 9-11

Avail NTIS HC A06/MF A01

The spleen, thymus and inguinal lymph nodes of rats exposed to a prolonged (24 hours) irradiation at a dose of 800 rad on the 10th day of the 20-day space flight aboard the biosatellite Cosmos-690 were examined histologically and cytologically. The lymph organs showed the changes typical of radiation-induced lesions. They did not display an aggravating or modifying effect of space flight factors on the development of radiation-induced lesions in lymph organs. It is emphasized that radiation-induced lesions at the above irradiation dose may mask weightlessness-induced effects in lymph organs. Author



**N79-16517#** Joint Publications Research Service, Arlington, Va

**MORPHOLOGICAL STUDY OF ADRENALS OF RATS IRRADIATED DURING FLIGHT ABOARD KOSMOS-690 SATELLITE**

Ye A Savina and Ye I Alekseyev *In its Space Biol and Aerospace Med*, Vol 13, No 1, 1979 (JPRS-72826) 14 Feb 1979 p 12-17 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med, no 1, (Moscow) 1979 p 12-15

Avail NTIS HC A06/MF A01

Adrenals of 12 rats flown aboard the biosatellite Cosmos-690 and 30 rats used in the ground-based experiments Control-1 and Control-2, were studied morphologically. The animals were sacrificed on the 2nd and 27th days after completion of the experiments (i.e., on the 12 and 37th days after irradiation at a total dose of 800 rad). A comparative study of morphological changes in the adrenals of flight and control rats did not show any distinct differences. It is therefore concluded that space flight factors did not produce a significant effect on the adrenal response to irradiation at a dose of 800 rad. Author

**N79-16518#** Joint Publications Research Service, Arlington, Va

**CHANGES IN METABOLISM OF SOLEUS MUSCLE TISSUE IN RATS FOLLOWING THE FLIGHT ABOARD THE KOSMOS-690 BIOSATELLITE**

M S Gayevskaya, N A Veresotskaya, N S Kolganova, Ye V Kolchina, L M Kurkina, and Ye A Nosova *In its Space Biol and Aerospace Med*, Vol 13, No 1, 1979 (JPRS-72826) 14 Feb 1979 p 18-22 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med, no 1, (Moscow), 1979 p 16-19

Avail NTIS HC A06/MF A01

The soleus muscle of flown rats did not show any effect of gamma-irradiation on the composition and enzymic activity of protein fractions. On the first postflight day a significant decrease in the content of myofibrillar and sarcoplasmic proteins in the soleus muscle was found. Besides, a drastic increase in the activity of aspartate amino-transferase and lactate dehydrogenase of sarcoplasmic proteins and an atrophic type change in the LDH pattern were demonstrated. Those changes were similar to the weightlessness-induced processes of atrophy and dystrophy and proved reversible. Author

**N79-16519#** Joint Publications Research Service, Arlington, Va

**CHANGES IN AMOUNT AND COMPOSITION OF PHOSPHOLIPIDS IN RAT SKELETAL MUSCLE MICROSOMAL FRACTION UNDER THE INFLUENCE OF A FLIGHT ABOARD THE KOSMOS-690 BIOSATELLITE**

R A Belitskaya *In its Space Biol and Aerospace Med*, Vol 13, No 1, 1979 (JPRS-72826) 14 Feb 1979 p 23-28 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow) no 1 1979 p 19-23

Avail NTIS HC A06/MF A01

The content and composition of phospholipids in the microsomes isolated from the back femoral muscles of rats flown for 20.5 days aboard the biosatellite Cosmos-690 were studied. Gamma-irradiation applied in the ground-based control experiments did not change the amount of total phospholipids in microsomes of skeletal muscles and altered insignificantly the content of their individual fractions. On the second postflight day a substantial decrease in the content of total and fractional phospholipids in microsomes was found. The decrease seems to be induced by weightlessness. On the 26th postflight day the content of total phospholipids returned to the normal whereas their fractional composition still remained changed. Author

**N79-16520#** Joint Publications Research Service, Arlington, Va

**ANTIORTHOSTATIC HYPOKINESIA AS AN APPROXIMATE MODEL OF WEIGHTLESSNESS**

V M Mikhaylov, V P Alekseyeva, M P Kuzmin, and E I Matsnev *In its Space Biol and Aerospace Med*, Vol 13, No 1, 1979 (JPRS-72826) 14 Feb 1979 p 29-35 refs Transl into

ENGLISH from Kosm Biol i Aviakosm Med (Moscow), no 1, 1979 p 23-28

Avail NTIS HC A06/MF A01

Eight test subjects were exposed to a five day bed rest experiment in the recumbent and head-down position (at angles of 0 deg, -4 deg, -8 deg, and -12 deg) to study the physiological effects of the exposure. The head-down tilting at -4 deg and -12 deg was shown to simulate physiological effects of real space flight better than the bed rest at 0 deg. The results made it possible to model an acute stage of weightlessness adaptation and to assay the contribution of gravity-induced blood redistribution to the physiological reactions. Author

**N79-16521#** Joint Publications Research Service, Arlington, Va

**BIOELECTRICAL ACTIVITY OF THE BRAIN DURING 49-DAY ANTIORTHOSTATIC HYPOKINESIA IN INDIVIDUALS WITH EARLY SIGNS OF VEGETOVASCULAR DYSFUNCTION**

D A Alekseyev *In its Space Biol and Aerospace Med*, Vol 13, No 1, 1979 (JPRS-72826) 14 Feb 1979 p 36-43 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow) no 1, 1979 p 28-34

Avail NTIS HC A06/MF A01

Cerebral bioelectric activity of 18 male test subjects, aged 25 to 42, was studied during their 49-day head-down tilting (-4 deg) and during recovery. On the 5th experimental day their EEG showed signs of CNS irritation and increased excitation in response to photostimulation. That was very marked in test subjects with autonomic-vascular dysfunctions. On the 15, 30, and particularly 45th experimental day, their EEG showed both diffusion and paroxysmal slow activity, CNS excitability decreased significantly during rhythmic photostimulation. By the 20th - 22nd day of recovery EEG parameters returned to normal. This indicates that the changes were reversible and that the therapeutic measures applied were effective. G G

**N79-16522#** Joint Publications Research Service, Arlington, Va

**CHANGES IN PROPERTIES OF RAT FEMUR AS A RESULT OF CRURAL EXARTICULATION AND HYPOKINESIA**

G P Stupakov, A I Volozhin, V A Korzhenyants, V V Korolev, V S Yagodovskiy and V I Yakusheva *In its Space Biol and Aerospace Med*, Vol 13, No 1, 1979 (JPRS-72826) 14 Feb 1979 p 44-51 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), no 1, 1979 p 35-40

Avail NTIS HC A06/MF A01

Rat experiments demonstrated that unilateral calf exarticulation leading to the loss of the leg weight-bearing functions resulted in a decrease of the density, ash content and mineral content in the femoral diaphysis. This manipulation reduced the mechanical strength and did not change the elastic properties of the bone. Histological examination showed osteoporosis in the cortical plate. Partial maintenance of the weight-bearing function in the animals with bilateral exarticulation of the calf prevented these changes. The results suggest that special steps taken to provide static load on leg may be effective countermeasures against atrophic changes in bones devoid of their weight-bearing function. Author

**N79-16523#** Joint Publications Research Service, Arlington, Va

**BLOOD CLOTTING FACTORS OF THE VASCULAR WALL AND MYOCARDIUM OF HYPOKINETIC RABBITS**

V I Inchina and N F Brattsev *In its Space Biol and Aerospace Med*, Vol 13, No 1, 1979 (JPRS-72826) 14 Feb 1979 p 52-58 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), no 1, 1979 p 41-46

Avail NTIS HC A06/MF A01

The effect of hypokinesia on the hemocoagulatory and fibrinolytic properties of aorta, myocardium and venae cavae was studied. Hypokinesia decreased thromboplastic activity of the intima and increased that of the mid- and outer layers of the

aorta Anticoagulatory properties of aortal and myocardial tissues increased whereas their antithrombin properties decreased Rabbit immobilization increased the content of fibrinolytic stimulants in the aorta and myocardium Author

**N79-16524#** Joint Publications Research Service, Arlington, Va

**EFFECT OF HYPOKINESIA ON ANIMAL RESISTANCE TO CHEMICAL AGENTS**

G P Tikhonova G I Solomin Yu P Bizin, and Z I Pilipyuk *In its Space Biol and Aerospace Med*, Vol 13 No 1, 1979 (JPRS-72826) 14 Feb 1979 p 59-64 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow) no 1 1979 p 46-50

Avail NTIS HC A06/MF A01

Resistance of rats exposed to 20-day hypokinesia in high concentrations of vapors of ethylacetate dioxan, and liquid fluorochlorocarbon was studied As compared with controls, lethality of the hypokinetic animals increased upon ethylacetate and dioxan breathing and decreased upon intoxication with liquid fluorochlorocarbon The hypokinetic animals showed decreased resistance to chronic effects of ethylacetate and perfluorated ester vapors (at a concentration of 10 and 100 mg/cu m for 90 and 30 days, respectively) This was suggested by functional and pathomorphological studies Author

**N79-16525#** Joint Publications Research Service Arlington, Va

**CEREBRAL HEMODYNAMICS AND VISUAL ANALYZER FUNCTION FOLLOWING EXPOSURE TO BRIGHT LIGHT**

V I Shostak and T I Bachurina *In its Space Biol and Aerospace Med*, Vol 13 No 1 1979 (JPRS-72826) 14 Feb 1979 p 65-69 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), no 1, 1979 p 50-53

Avail NTIS HC A06/MF A01

Non-anesthetized rabbits were exposed to short-term intensive photostimulation The experiments showed that the resultant increase in cerebral circulation occurred independently from systemic circulation cardiac and respiratory function Simultaneously, substantial adaptive changes in the optic system measured by electroretinography and optokinetic nystagmus developed Author

**N79-16526#** Joint Publications Research Service Arlington, Va

**EFFECTS OF PROLONGED UNIDIRECTIONAL SHIFT OF SLEEPING-WAKING CYCLE ON PHYSIOLOGICAL FUNCTIONS, MENTAL PRODUCTIVITY AND SLEEP OF MAN**

A N Litsov *In its Space Biol and Aerospace Med*, Vol 13, No 1 1979 (JPRS-72826) 14 Feb 1979 p 70-76 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), no 1 1979 p 53-58

Avail NTIS HC A06/MF A01

The results of three 30-day experiments are reported that studied the effect of migration of the sleep-alertness cycle on physiological functions psychic productivity, and sleep of man The migration was aggravated by the initial change of the cycle which varied from + or - 7 to + or - 11 hours All test subjects showed a counter-clockwise migration which amounted to a 15 hour shift every 4 to 5 days All test subjects demonstrated functional cerebral changes decline of psychic productivity and sleep disorders The level of those disturbances depended on the value of the initial shift of the sleep-alertness cycle and on the cumulation of the migration effect Those disorders were noted even when the prechanged sleep-alertness cycle approximated the normal pattern as a result of migration The results indicate that the migrating day-night pattern, particularly in combination with the initial shift of the sleep-alertness cycle cannot be recommended for manned space missions Good health condition and high work capacity of cosmonauts can be maintained, only if a 24-hour sleep-alertness cycle with a normal sleep pattern is provided G G

**N79-16527#** Joint Publications Research Service Arlington, Va

**ERGOMETRIC TESTS IN EXPERT MEDICAL CERTIFICATION OF FLIGHT PERSONNEL**

V V Zaretskiy V M Kondrakov and L Ya Kolganova *In its Space Biol and Aerospace Med* Vol 13 No 1, 1979 (JPRS-72826) 14 Feb 1979 p 77-82 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow) no 1, 1979 p 58-62

Avail NTIS HC A06/MF A01

In order to assess standard and relative indices of ergometry exercise tolerance and physical work capacity 64 members of flight crews with compensated atherosclerotic coronary cardiosclerosis (aged 28 to 56) were examined The studies were carried out using the Siemens cardiopulmonary complex at rest, at work load of 100 Wt/min for 5 min and during recovery for 10 min At the initiation of the experiment and during recovery ECG in 12 standard leads was recorded every other minute With respect to the age and clinical data the test subjects were subdivided into two groups Electrocardiographic study revealed insufficiency of coronary circulation in 63.7 percent of the first group and in 80.6 percent of the second group test subjects Ergometric measurements showed a distinct decrease of the chronotropic, inotropic and aerobic cardiac reserves, especially of the second group test subjects Ergometric parameters correlated well with the clinical and electrocardiographic data The results can be used in the diagnostics evaluation of cardiopulmonary functional and reserve capabilities, and support of expertise recommendations Author

**N79-16528#** Joint Publications Research Service Arlington, Va

**CONCENTRATION OF TRACE CONTAMINANTS DURING GAS CHROMATOGRAPHY AND CHROMATO-MASS SPECTROMETRY IN BIOMEDICAL RESEARCH**

V I Ivanov, A N Ivanov G A Gaziyeu and L I Kobzeva *In its Space Biol and Aerospace Med*, Vol 13, No 1 1979 (JPRS-72826) 14 Feb 1979 p 83-86 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow) no 1, 1979 p 62-64

Avail NTIS HC A06/MF A01

The emission kinetics of carbon dioxide and subsequent accumulation in insulating suits were studied by a sensitive method of gas chromatography in which carbon dioxide was converted to methane by means of catalytic hydration on a nickel catalyst applied to an INZ-600 carrier followed by detection of methane on a flame-ionization detector Maximum conversion of carbon dioxide to methane to 98 percent was obtained at a catalyst temperature of 420-450 C The threshold of sensitivity of assaying carbon dioxide constituted 0.05 mg/cu m in a 1-liter sample The rate of emission of amines is an important metabolic index of the body A procedure of preconcentration of trace levels by means of evaporation of an absorbant solution under vacuum was developed G G

**N79-16530#** Joint Publications Research Service Arlington, Va

**EFFECTS OF SPACE FLIGHT FACTORS ON ELECTROLYTE COMPOSITION OF RAT SKELETAL MUSCLES**

V P Nesterov and R A Tigranyan *In its Space Biol and Aerospace Med* Vol 13 No 1 1979 (JPRS-72826) 14 Feb 1979 p 90-94 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow) no 1 1979 p 66-68

Avail NTIS HC A06/MF A01

Concentration levels of ions of Na K, Ca and Mg in connective tissues, as well as endogenous media of rats involved in space flight failed to demonstrate appreciable changes in relative ion selectivity The results indicate that 22-day exposure to space flight factors does not induce appreciable changes in electrolyte composition of rat muscle tissue G G

**N79-16531#** Joint Publications Research Service Arlington, Va

**PROSPECTS OF USING JAPANESE QUAIL IN BIOLOGICAL LIFE SUPPORT SYSTEMS**

Ye Ya Shepelev, N A Agadzanyan, V F Mishchenko, and V I Fofanov *In its Space Biol and Aerospace Med* Vol 13, No 1 1979 (JPRS-72826) 14 Feb 1979 p 95-97 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), no 1 1979 p 69-70

Avail NTIS HC A06/MF A01

Analysis of bibliographical distinctions (height, development egg-laying time and others) and productive qualities (rate of reproduction, egg yield, index of transformation quality of eggs and meat) of the Japanese quail justifies consideration of the Japanese quail for inclusion as one of the components of heterotrophic organisms in a closed biological life support system Author

**N79-16532#** Joint Publications Research Service, Arlington, Va

#### **EFFECTS OF LBNP ON CATECHOLAMINES AND ADRENAL CORTEX**

N F Kalita and N A Davydova *In its Space Biol and Aerospace Med*, Vol 13, No 1 1979 (JPRS-72826) 14 Feb 1979 p 98-100 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), no 1, 1979 p 70-71

Avail NTIS HC A06/MF A01

The LBNP tests were associated with an appreciable decrease of AC androgenic function whereas SAS activity one h after the test was characterized by an increase in hormonal activity of the system with subsequent prevalence of mediatory activity one day after the test These changes warrant the assumption that the LBNP test induces a stress reaction in subjects Author

**N79-16533#** Joint Publications Research Service Arlington, Va

#### **CORRECTION OF TRANSCAPILLARY EXCHANGE IN MAN UNDER THE INFLUENCE OF ROTATION ON A CENTRIFUGE WHILE IMMERSSED IN WATER**

K I Gogolev *In its Space Biol and Aerospace Med*, Vol 13 No 1, 1979 (JPRS-72826) 14 Feb 1979 p 101-104 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow), no 1 1979 p 72-74

Avail NTIS HC A06/MF A01

Transcapillary exchange studies in subjects revealed that both background rotation on the centrifuge (3 units +Gz, 5 min) and pure immersion induced a change in fluid shifts and protein fractions between blood and the perivascular space Thus, the hemodynamic changes occurring in the vascular system during centrifugation prior to immersion led to an increase fluid shift to the interstitial space in the 2d min of the aftereffect period In the 12th min there was complete restoration of fluid migration levels, however, there was a change in the shifting of albumins to the opposite direction characterized by passage into the blood stream G G

**N79-16534#** Joint Publications Research Service, Arlington Va

#### **REHABILITATION MEASURES USED TO RESTORE PHYSICAL FITNESS OF MAN AFTER LONG-TERM RESTRICTION OF MOVEMENT**

B F Demida and G V Machinskiy *In its Space Biol and Aerospace Med* Vol 13 No 1 1979 (JPRS-72826) 14 Feb 1979 p 105-107 refs Transl into ENGLISH from Kosm Biol i Aviakosm Med (Moscow) no 1 1979 p 74-75

Avail NTIS HC A06/MF A01

A decrease in physical fitness and functional level of the cardiorespiratory system was observed after space flights and ground-based experiments simulating flight conditions The efficacy of two rehabilitation regimens designed to speedily restore physical fitness and functional level of the cardiorespiratory was evaluated Physical exercises in a seated position and in a supine position, were utilized G G

**N79-16535** Houston Univ, Tex  
**MATHEMATICAL SIMULATION OF THE HUMAN CIR-**

#### **CULATORY SYSTEM Ph D Thesis**

Humphrey Hill Hardy 1978 169 p  
Avail Univ Microfilms Order No 7901186

A digital model of the human circulatory system was developed which simulates pulsatile blood flow and gas transport and exchange The model was designed specifically to study short term G stress encountered in modern aenal combat maneuvers and incorporates a realistic representation of the nonlinear elastic characteristics of circulatory elements and the related pressure dependent flow resistance characteristic of these elements One form for the pressure-volume relationship used in the model was shown to fit in vivo data for arteries, veins, and left atrium The resistance-pressure relationship which follows using the Poiseuille-Hagen formula was shown to fit lung data The oxygen saturation curve and the carbon dioxide dissociation curve were represented by published equations The systemic circulation is partitioned into four zones head, upper torso lower torso and legs while the pulmonary circulation is partitioned into six zones with a corresponding distribution of ventilation This model has been shown to properly simulate experimental human data for passive breathing in a prone subject The computed carbon dioxide and oxygen partial pressures vary realistically around measured average partial pressures from human subjects The computed blood pressure-time volume-time, and flow-time curves match corresponding curves for human data Under sinusoidal G sub z variations, the model predicts realistic variations of body segment volumes, flows and pressures Dissert Abstr

#### **N79-16536** West Virginia Univ, Morgantown **AN INVESTIGATION TO DETERMINE THE EFFECT OF PHYSICAL CONDITIONING UPON FIBRINOLYTIC REACTIVITY IN NORMAL YOUNG MEN Ph D Thesis**

Marguerite Kersey Carman 1978 84 p  
Avail Univ Microfilms Order No 7900861

The intent of this study was to determine if the fibrinolytic reactivity, or percent change in response to exercise, could be conditioned through an aerobic training program Thirty-five undergraduate male subjects between the ages of seventeen and twenty-two volunteered for the study Twenty-seven subjects were randomly assigned to the experimental group while the remaining eight made up the control group The experimental group engaged in an aerobic conditioning program from four to five weeks completing a total of twenty-five miles At least one mile was run per session Fibrinolytic activity improves with aerobic conditioning as coagulation becomes less accelerated post-exercise After aerobic conditioning subjects have a lower resting heart rate and are able to increase the work load with the same amount of stress to the body When subjects become less active there is a decrease in fibrinolytic reactivity an increase in resting heart rate, and a decreased ability to work with the same amount of stress to the body Dissert Abstr

#### **N79-16537** Case Western Reserve Univ, Cleveland, Ohio **SYNCHRONOUS BRAIN EVOKED POTENTIAL CORRELATES OF DIRECTED ATTENTION IN HUMANS Ph D Thesis**

Thomas Francis Collura 1978 68 p  
Avail Univ Microfilms Order No 7901509

Synchronous filtering of EEG evoked potentials is a sensitive new tool for the study of dynamic sensory brain processes, through a multi-evoked potential approach several different brain centers and processes can be monitored in parallel and in real time using the signal from a single electrode location In these studies, the relationship between evoked potentials and selective attention is studied in 10 subjects who voluntarily control their attention in order to perform well in a difficult sensory discrimination task Evoked potential records provide information regarding attention, general arousal, and learning allowing these processes to be effectively detected and quantified Dissert Abstr

#### **N79-16538** Utah Univ, Salt Lake City **NUMERICAL STUDIES OF ABSORPTION OF ELECTROMAGNETIC ENERGY BY MAN Ph D Thesis**

Mark Joseph Hagmann 1978 167 p  
Avail Univ Microfilms Order No 7901556

A new synthesis procedure was developed for the design of

antenna arrays where stepwise variation is desired in the radiation pattern. The new procedure was used to design a waveguide slot array for use in microwave biological effects research. Useful convergence criteria were established for moment method solutions in electromagnetics. New procedures were developed for improving convergence in two-dimensional solutions in electromagnetics. Interpolants were developed which improve convergence in three-dimensional problems. A realistic model of man was made using an array of 180 cubical cells to represent the form of the 50th percentile standard man. Ground reflector, and multibody effects were treated numerically with models of man for the first time. Dissert Abstr

**N79-16639** Wake Forest Univ Winston-Salem NC  
**A TRANSIENT ANALYSIS OF THE CEREBROVASCULAR RESPONSE TO CARBON DIOXIDE** Ph D Thesis

David Allen Wilson 1978 221 p  
 Avail Univ Microfilms Order No 7901550

The importance of carbon dioxide (CO<sub>2</sub>) in the regulation of cerebral blood flow is well recognized yet little information is available regarding the time-dependent factors which may influence the relationship between CO<sub>2</sub> and cerebral blood flow (CBF) in the dynamic state. The present studies were designed for the purposes of determining if CBF is directly related in time to arterial partial pressure of CO<sub>2</sub> (PaCO<sub>2</sub>) during a forced change in PaCO<sub>2</sub> and if not then to further study the effects of additional factors which might be important influences on the dynamic relationship between CBF and CO<sub>2</sub>. The findings provide the framework for a concept of the functional aspects of CBF control. This concept was presented in the form of a single compartment model for the acute regulation of tissue PCO<sub>2</sub>, by blood flow using a proportional form of control in which it was assumed that cerebrovascular resistance was a linear function of tissue PCO<sub>2</sub>. The steady-state and nonsteady-state relationships between PaCO<sub>2</sub>, PvCO<sub>2</sub> and CBF were reasonably well approximated by this model. Dissert Abstr

**N79-16540** California Univ Los Angeles  
**A CORRELATION OF THE EFFECTS OF CATIONIC UNCOUPLERS ON INTACT CARDIAC MUSCLE AND ON CALCIUM BOUND TO ISOLATED CARDIAC MUSCLE PLASMA MEMBRANES** Ph D Thesis

Donald Martin Bers 1978 151 p  
 Avail Univ Microfilms Order No 7901335

The concentration of Ca<sup>2+</sup> surrounding the myofibrils determines the force of contraction in muscle cells. The strength of cardiac muscle contraction depends directly on the extracellular Ca<sup>2+</sup> concentration up to about 12 mM and is rapidly decreased upon exposure to La<sup>3+</sup>. This, in conjunction with much other data, has led to the hypothesis that Ca<sup>2+</sup> bound to superficial sites in the mammalian myocardium control cardiac contractility. The aim of this study is to gain insight into the localization of contractile-dependent Ca<sup>2+</sup> in cardiac muscle, particularly with regard to the cardiac sarcolemma. A procedure was developed for the isolation of cardiac sarcolemma vesicles. These vesicles are purified about 10 fold (with respect to the tissue homogenate) in K<sup>+</sup>-stimulated p-nitrophenyl phosphatase, Na<sup>+</sup>-K<sup>+</sup>-ATPase, 5 nucleotidase activities and sialic acid content, all of which are believed to be components of the sarcolemma. Dissert Abstr

**N79-16541\*** West Florida Univ Pensacola  
**PERSONNEL NEUTRON MONITORING IN SPACE**

Hermann J Schaefer 1 Nov 1978 22 p refs  
 (Contract NAS9-15417)  
 (NASA-CR-151865) Avail NTIS HC A02/MF A01 CSCL 06B

A brief review is presented of available information on the galactic neutron spectrum. An examination is made of the difficulties encountered in the determination of the dose equivalent of neutron recoil protons in the presence of a substantially larger background of trapped and star-produced protons as well as other ionizing particles in space. LS

**N79-16542\*** Lovelace Foundation for Medical Education and Research, Albuquerque N Mex Dept of Physiology

**SPECIALIZED PHYSIOLOGICAL STUDIES IN SUPPORT OF MANNED SPACE FLIGHT** Final Report

U C Luft J A Loeppky, M D Venters, and Y Kobayashi  
 Dec 1978 176 p refs  
 (Contract NAS9-15483)  
 (NASA-CR-151876) Avail NTIS HC A09/MF A01 CSCL 06P

The effects of a diuretic (Lasix) induced dehydration on the cardiovascular and hematological responses to lower body negative pressure (LBNP) were analyzed and compared to previous observations on dehydration following exercise in the heat. During LBNP runs the subjects were monitored for changes in blood volume, heart rate, blood pressure, and variations in the volume of the left calf. It was concluded that Lasix dehydration produced a depletion of the body electrolytes at the expense of both the plasma and extravascular compartments. Striking differences were found between those subjects who were physically active (Runners R) and those who did not engage in any regular physical activity (Non-runners NR). Tolerance to LBNP (Torr x min) was significantly lower in the R's than the NR's before and after dehydration; however, the R's lost more of their tolerance after dehydration with Lasix than after exercise in the heat for about the same fluid loss. The opposite was true for the NR's. Two factors appear to be responsible for the lower LBNP tolerance in R's: parasympathetic inhibition of cardiac activity during LBNP and a greater propensity to pool blood in the lower extremities. GG

**N79-16543\*** Denver Research Inst, Colo  
**HYBRIDIZATION OF BIOMEDICAL CIRCUITRY** Final Report

George A Rinard 20 Dec 1978 87 p  
 (Contract NAS9-15206)  
 (NASA-CR-151874 DRI-2691) Avail NTIS HC A05/MF A01 CSCL 06B

The design and fabrication of low power hybrid circuits to perform vital signs monitoring are reported. The circuits consist of (1) clock (2) ECG amplifier and cardiachometer signal conditioner, (3) impedance pneumograph and respiration rate processor, (4) hear/breath rate processor (5) temperature monitor and (6) LCD display. GG

**N79-16544\*** Battelle Pacific Northwest Labs Richland, Wash  
 Occupational and Environmental Safety Dept  
**KINETIC MEASUREMENTS OF BONE MINERAL METABOLISM: THE USE OF Na-22 AS A TRACER FOR LONG-TERM BONE MINERAL TURNOVER STUDIES** Final Report, 7 Apr - 30 Nov 1978

H E Palmer 30 Nov 1978 24 p refs  
 (Contracts NAS9-15544 NAS9-14248, NASA Order A-13044-B(KT))  
 (NASA-CR-151868) Avail NTIS HC A02/MF A01 CSCL 06P

Sodium-22 was studied as a tracer for bone mineral metabolism in rats and dogs. When incorporated into bone during growth from birth to adulthood, the bone becomes uniformly tagged with (22)Na which is released through the metabolic turnover of the bone. The (22)Na which is not incorporated in the bone matrix is rapidly excreted within a few days when animals are fed high but nontoxic levels of NaCl. The (22)Na tracer can be used to measure bone mineral loss in animals during space flight and in research on bone disease. Author

**N79-16545\*** Gould, Inc Oxnard Calif Measurements System Div  
**DEVELOPMENT OF AN ELECTRICAL ENERGY CONVERTER FOR CIRCULATORY DEVICE** Final Report, 20 May 1977 - 9 Jun 1978

J A Chambers, L A Davies, L M Mahler and T T Yen Jun 1978 353 p refs  
 (Contract N01-HV-4-2906)  
 (PB-296738/0 NIH-N01-HV-4-2906-5) Avail NTIS HC A16/MF A01 CSCL 06L

Components for seven energy converters are completed. Four station ferro-fluid seal test fixture is completed. Improved motors, now considered standard, increased converters efficiency 45%

percent to 55 87 percent In-vitro tests included lubrication studies pneumatic blood pump actuation, bladder influence on pump fill, influence of assist springs on inflow to blood pump, and extensive testing on pump actuation pads All in-vivo control systems are completed Results of 23 in-vivo tests show good left ventricular pressure reduction and capture of full cardiac output  
GRA

**N79-16546#** Environmental Research Lab., Duluth Minn  
**PROCEEDINGS OF THE FIRST AND SECOND USA-USSR SYMPOSIA ON THE EFFECTS OF POLLUTANTS UPON AQUATIC ECOSYSTEMS VOLUME 1 USA SYMPOSIUM VOLUME 2 USSR SYMPOSIUM**

Aug 1978 413 p refs Symp held at Duluth Minn 21-23 Oct 1975 and at Borok USSR, 22-26 Jun 1976 Prepared in cooperation with Academy of Sciences (USSR) Borok (PB-287219/0, EPA-600/3-78-076-Vol-1 EPA-600/3-78-076-Vol-2) Avail NTIS HC A18/MF A01 CSCI O6T

Broadly based review papers designed to familiarize attendees with a wide cross-sectional representation of ecologically related activities in each country, and narrowly specific state-of-the-art scientific discussions are presented The presentations focus upon methodology historical aspects, microbial and abiotic degradation processes, trace metal problems, effects of toxicants, proposed species indices, and studies of fate and transport of pollutants  
GRA

**N79-16547#** Midwest Research Inst., Minnetonka, Minn North Star Div

**EVALUATION OF FLUOROPOLYMER MEMBRANES IN OXYGENATORS Final Report, 15 Aug 1976 - 14 Dec 1977**

Robert J Petersen, Michael J Steuck and Paulette Y Johnston Sep 1978 49 p refs (Contract N01-HV-6-2912) (PB-286698/6 NIH-N01-HV-6-2912-2) Avail NTIS HC A03/MF A01 CSCI O6L

Development of a novel thromboresistant biomaterial fluorinated ethylcellulose (FEC) for use in membrane oxygenators was continued Thin film composite membranes of FEC on Celgard microporous polypropylene film were fabricated in quantity under clean room conditions Techniques were developed for fabrication of high performance spiral-coil membrane oxygenators and initial tests were performed using lambs as the experimental animal Oxygen-to-blood transfer rates up to 50 ml/min at 1000 ml/min blood flow through 0.8-square-meter devices were achieved under specific operating conditions Additional studies on the blood compatibility of FEC further confirmed its high thromboresistance very low hemolysis rate, and low level of interaction with blood platelets  
GRA

**N79-16548#** Civil Service Commission Washington D C Personnel Research and Development Center

**SOME VARIATIONS ON DERIVATIONS BY PRIMOFF AND THEIR EXTENSIONS Final Report**

Vern W Tury Aug 1978 13 p (PB-287298/4, TN-78-3) Avail NTIS HC A02/MF A01 CSCI O5J

The statistical properties of J-coefficients were examined, and their identities with standard statistical expressions were established A new formula was introduced to provide a computational saving The original J-coefficient methodology was extended to enable new applications of synthetic validation These extensions provide formulas for the synthetic validity of an unweighted battery of conventional tests an optimally weighted battery of conventional tests and an optimal weighting of tailored tests constructed from several item banks  
GRA

**N79-16549** Virginia Univ Charlottesville  
**A TRADE-OFF ANALYSIS DESIGN TOOL AIRCRAFT INTERIOR NOISE/MOTION/PASSENGER SATISFACTION MODEL Ph.D Thesis**

Ashok Narasimhaia Rudrapatna 1977 215 p  
Avail Univ Microfilms Order No 7901168

A design tool was developed to enhance aircraft passenger satisfaction It can be used by systems designers for conducting tradeoff analyses of future aircraft interior environments and for evaluating existing aircraft The effect of aircraft interior motion and noise on passenger comfort and satisfaction has been modelled The effects of individual aircraft noise sources have been accounted for Further the impact of noise on passenger activities and noise levels to safeguard passenger hearing have been investigated The motion-noise effect models not only provide a means for tradeoff analyses between noise and motion variables but they also provide a framework for optimizing noise reduction among noise sources The data for the models have been collected on-board commercial aircraft flights and specially scheduled (flight and ground) tests  
Dissert Abstr

**N79-16550\*#** GARD, Inc Niles Ill  
**FOUR-MAN RATED DUAL CATALYST SYSTEM FOR THE RECOVERY OF WATER FROM URINE Final Report**

P Budininkas Nov 1978 46 p (Contract NAS2-9715) (NASA-CR-152227) Avail NTIS HC A03/MF A01 CSCI O6K

The catalytic system was integrated with a 4-man rated urine wick evaporator During operation urine vapor produced by the wick-evaporator was treated in the catalytic system to remove ammonia and volatile hydrocarbons, and water was recovered by condensation in a water cooled condenser The system operated completely automatically and required no manual adjustments except periodic supply of urine and removal of the recovered water Although the system was designed for treating 0.325 kg urine per hour this rate could be achieved only with a fresh wick then gradually decreased as the wick became saturated with urine solids The average urine treatment rates achieved during each of the three endurance tests were 0.137, 0.217 and 0.235 kg/hr The quality of the recovered water meets drinking water standards with the exception of a generally low pH  
G G

**N79-16551\*#** Systems Control Inc., Palo Alto Calif  
**HUMAN OPERATOR IDENTIFICATION MODEL AND RELATED COMPUTER PROGRAMS Final Report**

K M Kessler and J N Mohr Dec 1978 145 p (Contract NAS2-9754) (NASA-CR-152237) Avail NTIS HC A07/MF A01 CSCI O5H

Four computer programs which provide computational assistance in the analysis of man/machine systems are reported The programs are (1) Modified Transfer Function Program (TF) (2) Time Varying Response Program (TVSR), (3) Optimal Simulation Program (TVOPT), and (4) Linear Identification Program (SCIDNT) The TV program converts the time domain state variable system representative to frequency domain transfer function system representation The TVSR program computes time histories of the input/output responses of the human operator model The TVOPT program is an optimal simulation program and is similar to TVSR in that it produces time histories of system states associated with an operator in the loop system The differences between the two programs are presented The SCIDNT program is an open loop identification code which operates on the simulated data from TVOPT (or TVSR) or real operator data from motion simulators  
G Y

**N79-16552\*#** Essex Corp., Huntsville, Ala  
**EARTH ORBITAL TELEOPERATOR SYSTEMS EVALUATION Year End Report, 1978**

Nicholas Shields Jr Phillip H Slaughter, Ronald G Brye and David E Henderson 1 Feb 1979 126 p refs (Contract NAS8-31848) (NASA-CR-150912 H-79-02) Avail NTIS HC A07/MF A01 CSCI O5H

The mechanical extension of the human operator to remote and specialized environments poses a series of complex operational questions A technical and scientific team was organized to investigate these questions through conducting specific laboratory and analytical studies The intent of the studies was to determine the human operator requirements for remotely manned systems

and to determine the particular effects that various system parameters have on human operator performance. In so doing certain design criteria based on empirically derived data concerning the ultimate control system the human operator were added to the Teleoperator Development Program G Y

**N79-16553\*** Martin Marietta Corp Denver Colo  
**MANNED MANEUVERING UNIT USER'S GUIDE**  
J A Lenda May 1978 73 p

(Contract NAS9-14593)

(NASA-CR-151864 MCR-78-517) Avail NTIS  
HC A04/MF A01 CSCL 05H

The space shuttle will provide an opportunity to extend and enhance the crew's inherent capabilities in orbit by allowing them to operate effectively outside of their spacecraft by means of extravehicular activity. For this role the shuttle crew will have a new easier to don and operate space suit with integral life support system and a self-contained propulsive backpack. The backpack called the manned maneuvering unit, will allow the crew to operate beyond the confines of the Shuttle cargo bay and fly to any part of their own spacecraft or to nearby free-flying payloads or structure. This independent mobility will be used to support a wide variety of activities including free-space transfer of cargo and personnel inspection and monitoring of orbital operations, and construction and assembly of large structures in orbit J A M

**N79-16554\*** Texas Center for Research Austin  
**SIMPLE MODELS FOR THE SHUTTLE REMOTE MANIPULATOR SYSTEM Final Report**

W T Fowler B D Tapley, and B E Schutz [1978] 63 p

(Contract NAS9-15385)

(NASA-CR-151881) Avail NTIS HC A04/MF A01 CSCL 05H

The investigation is aimed at establishing a series of simple models which can be used to study the forces and moments which occur due to the reaction control system (RCS) jet plume firings during a deployment or retrieval of an IUS type payload. The models considered in this investigation are primarily planar in nature. In this study primary attention is given to the roles the payload play in determining the overall moments on the remote manipulator system arm L S

**N79-16555\*** Royal Naval Personnel Research Committee, London (England)

**HUMAN FACTORS SPEECH COMMUNICATION**

A Carpenter Mar 1978 35 p refs

(PS-5/78 BR63434) Avail NTIS HC A03/MF A01

Electrical transmission of speech is discussed in terms of improving the communication media. Understanding and a quicker exchange of ideas is emphasized. Human factors are considered J M S

**N79-16556\*** Rhode Island Univ, Kingston  
**GENERAL METHODS TO ENABLE ROBOTS WITH VISION TO ACQUIRE, ORIENT, AND TRANSPORT WORKPIECES**  
Progress Report, 15 Aug 1977 - 15 Jul 1978

J Birk, R Kelley L Wilson V Badami and T Browell 15 Jul 1978 237 p refs

(Grant NSF APR-74-13935)

(PB-287199/4 NSF/RA-780260 PR-4) Avail NTIS  
HC A11/MF A01 CSCL 13H

An experimental robot is described which uses vision to acquire arbitrarily oriented workpieces from a bin and to compute workpiece orientation in the hand and then transports the piece so that it assumes a predetermined pose at a goal site. The experimental system is operational although many ideas to improve performance need to be tested. Papers presented at conferences on the following topics are discussed in the appendices: workpiece transportation by robots using vision; image feature extraction using diameter limited gradient direction histograms; identification of object symmetry from multiple views; acquiring workpieces, URI Mark IV Arm, three axis rotary joint wrist and Anorad XYZ Tables; kinematic equations for the URI Mark IV Arm and the arm joint solution; surface adapting vacuum gripper; camera alignment; gage for measuring workpiece pose.

software descriptions, proposed solution to the continuous pose estimation problem and breakaway system. Appendices constitute the bulk of the text GRA

**N79-16557\*** National Fire Prevention and Control Administration Washington D C

**PROTECTIVE CLOTHING AND EQUIPMENT FOR FIRE-FIGHTERS CURRENT STANDARDS AND PRACTICES Final Report**

Andrew F Sears and Edward V Clougherty Aug 1978 38 p refs

(PB-286990/7) Avail NTIS HC A03/MF A01 CSCL 06Q

An assessment of the state-of-the-art in protective clothing and equipment for the firefighter is provided with a description of relevant standards which fire departments can use in developing purchase specifications. Areas covered by the report are: helmets, face shields and goggles; fire coats and trousers, boots and shoes; gloves; station uniforms and respiratory protective devices GRA

**N79-16558\*** Purdue Univ Lafayette Ind School of Electrical Engineering

**ADVANCED INDUSTRIAL ROBOT CONTROL SYSTEMS**

Technical Report, 1 Jul 1977 - 1 Jan 1978

R Paul, J Luh, J Bender R Brown and M Remington May 1978 94 p refs

(Grant NSF APR-77-14533)

(PB-287273/7, TR-EE78-25 NSF/RA-780167) Avail NTIS  
HC A05/MF A01 CSCL 13H

Industrial robot control schemes to improve the performance of currently available robots are developed. The need to extend the flexibility and usefulness of current industrial robots and to provide a solid base for future advanced systems based on computer control techniques and dynamic manipulation models are examined. This report describes the work performed during the first six months since the project's inception GRA

**N79-16559\*** Scientific Systems, Inc Cambridge Mass

**MICROPROCESSOR BASED PROSTHETIC CONTROL Final Report**

Donald E Gustafson and P C Doerschuk Apr 1978 97 p refs

(Grant NSF APR-77-19672)

(PB-286652/3 NSF/RA-780068) Avail NTIS  
HC A05/MF A01 CSCL 06L

The feasibility of using advanced techniques in a multifunction prosthesis was investigated. The specific problem area addressed is industrial productivity which is presently quite limited for people using prosthetic devices. A preliminary feasibility analysis of multifunction discrimination using myoelectric signals, a method which has not yet been reduced to practice was made. The present approach specifically is designed to ameliorate these difficulties and uses a newly-developed pattern recognition technique which offers great speed and has desirable statistical optimality properties GRA

**N79-16560\*** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

**OPTIMISATION OF PILOT CAPABILITY AND AVIONIC SYSTEM DESIGN**

F S Stringer ed Nov 1978 95 p refs

(AGARD-AR-118, ISBN-92-835-1292-8) Avail NTIS  
HC A05/MF A01

The objective of the Group was to prepare a joint report which would guide future combat aircraft and system designers to achieve a better blend of aircrew and machine.

**N79-16561\*** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

**OPTIMISATION OF PILOT CAPABILITY AND AVIONIC SYSTEM DESIGN, INTRODUCTION**

In its Optimisation of Pilot Capability and Avionic System Design Nov 1978 4 p

Avail NTIS HC A05/MF A01

The main objectives are to curb the continued development



of more sophisticated equipment which disregards the human factors, to examine the aircrew potential, and to suggest how the latter could be better exploited to satisfy the operational requirements. The crew capabilities and limitations are examined, and then methods are devised to match the system to these capabilities. Training methods that will best exploit aircrew capabilities are discussed. L S

**N79-16562#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

#### **HUMAN CAPABILITIES**

*In its* Optimisation of Pilot Capability and Avionic System Design  
Nov 1978 6 p refs

Avail NTIS HC A05/MF A01

A brief description is given of man's capabilities. A bibliography is provided to allow more detailed study of specific aspects. Author

**N79-16563#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

#### **SYSTEMS DESIGN**

*In its* Optimisation of Pilot Capability and Avionic System Design  
Nov 1978 18 p refs

Avail NTIS HC A05/MF A01

It is pointed out that in designing man-machine subsystems, technology offers many similar solutions in answer to each partial problem and as a result design decisions are liable to be taken on a limited number of possible alternatives open to analysis, thus sometimes giving rise to vague criteria. It is stressed that systematic analysis techniques are needed to combat this problem. L S

**N79-16564#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

#### **PILOT WORKLOAD QUALIFICATION FOR AVIONICS DESIGN**

*In its* Optimisation of Pilot Capability and Avionic System Design  
Nov 1978 8 p refs

Avail NTIS HC A05/MF A01

Recent avionics development has been in the direction of increasing complexity, cost and separation of aircraft control from the human pilot. One current underlying philosophy in avionics design seems to be to remove aircraft control from the human pilot whenever the required profile requires him to handle flight information at a rate beyond his inherent capability. This philosophy has probably resulted in avionics over-automation. A properly posed avionics system design problem should include human capability constraints cast in systems engineering terms. It is this modelling of human capability which is treated here. Author

**N79-16565#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

#### **TRAINING IMPLICATIONS**

*In its* Optimisation of Pilot Capability and Avionic System Design  
Nov 1978 12 p refs

Avail NTIS HC A05/MF A01

The fascination with technology resulted in a tendency to optimize the equipment portion of a system sometimes almost to exclusion of considerations for the human who must operate the system. This trend toward automation and sophisticated equipment has apparently contributed to the ever-increasing cost of aircraft. The purpose here is to review the concept of reducing the level of automation and increasing the responsibility for task completion to the man in the man-machine loop and possible implications for training. Author

**N79-16566#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

#### **THE DESIGN OF AIR COMBAT AIRCRAFT**

*In its* Optimisation of Pilot Capability and Avionic System Design  
Nov 1978 16 p refs

Avail NTIS HC A05/MF A01

Various ways are suggested in which the crew station designer could reduce avionics complexity and costs, depending upon the aircraft mission. The air combat aircraft is taken as an example. Firstly the combat aircraft missions are described. Then some of the associated problems are considered, followed by suggested methods to reduce complexity and cost of the avionics of this type of aircraft. Methods used in the design of the total aircraft system are discussed subsequently together with the system tradeoffs the designer must face. Conclusions and recommendations for future research are then offered. Author

**N79-16567#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

#### **GROUND ATTACK**

*In its* Optimisation of Pilot Capability and Avionic System Design  
Nov 1978 7 p

Avail NTIS HC A05/MF A01

The ground attack aircraft missions are described. Some of the associated problems are considered followed by suggested methods to reduce complexity and cost of the avionics of this type of aircraft. Methods used in the design of the total aircraft system, are discussed together with the system tradeoffs the designer must face. L S

**N79-16568#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France)

#### **THE HELICOPTER**

*In its* Optimisation of Pilot Capability and Avionic System Design  
Nov 1978 9 p refs

Avail NTIS HC A05/MF A01

The main theme of this discussion on helicopters is the optimisation of the balance between human capability and system automation with the object of providing the most effective operational system and the most cost effective designs of both helicopter and equipment. Author

**N79-16793#** Joint Publications Research Service, Arlington, Va

#### **ANTIRADIATION SUIT AND OTHER SPECIAL CLOTHING AT INDUSTRIAL SAFETY EXHIBITION**

D Pipko. *In its* Transl on USSR Sci and Technol. Biomed and Behavioral Sci., No 55 (JPRS-72716). 29 Jan 1979 p 23-26. Transl into ENGLISH from Sots. Industriya (Moscow), 7 Dec 1978 p 4.

Avail NTIS HC A05/MF A01

An antiradiation suit is described. This suit protects the wearer from superhigh frequencies in electromagnetic fields. This protection was afforded by thin copper wire shielding mesh woven into the cotton fabric of the overalls and mittens. The helmet was metallic, and its face shield was made from transparent shielding material. Along with the antiradiation suit suits for workers in ferrous metallurgy and glass production and suits for workers in medicinal preparations were featured. J A M

**N79-17475\*#** Massachusetts Inst of Tech, Cambridge

#### **PROCEEDINGS, 13TH ANNUAL CONFERENCE ON MANUAL CONTROL**

1977 470 p refs. Conf held at Cambridge, Mass. 15-17 Jun 1977 sponsored by NASA and DOT (NASA-CR-158107). Avail NTIS HC A20/MF A01 CSCI 05H

Theoretical aspects of manual control theory are discussed. Specific topics covered include tracking performance, attention allocation and mental load, surface vehicle control, monitoring behavior and supervisory control, manipulators and prosthetics, aerospace vehicle control, motion and visual cues and displays and controls.

**N79-17477\*#** Bolt Beranek and Newman Inc, Cambridge, Mass

#### **THE EFFECTS OF DEVIATE INTERNAL REPRESENTATIONS IN THE OPTIMAL MODEL OF THE HUMAN OPERATOR**

Sheldon Baron and Jeffrey E. Berliner / In MIT Proc 13th Ann Conf on Manual Control 1977 p 17-26 refs

Avail NTIS HC A20/MF A01 CSCL 05H

Some of the issues and equations involved in predicting closed-loop man machine performance for situations in which the human operators knowledge of the system and/or environment are imperfect are presented and discussed. Several examples to demonstrate some of the effects to be expected when such is the case are then given. J M S

**N79-17479\*#** State Univ of New York at Buffalo, Amherst  
**A QUASI-LINEAR CONTROL THEORY ANALYSIS OF TIMESHARING SKILLS**

Diane Damos and Christopher D. Wickens (III) Univ / In MIT Proc 13th Ann Conf on Manual Control 1977 p 35-43 refs

Avail NTIS HC A20/MF A01 CSCL 05H

Performance with practice on two dual-task combinations dual-axis tracking and two discrete information processing tasks is examined in an effort to identify the presence and development of specific time sharing skills such as parallel information processing or rapid intertask switching. The generality of time sharing skills also is investigated by examining transfer of these skills between the two qualitatively different task combinations. J M S

**N79-17480\*#** National Aeronautics and Space Administration  
 Ames Research Center Moffett Field Calif  
**A DUAL-LOOP MODEL OF THE HUMAN CONTROLLER**

Ronald A. Hess / In MIT Proc 13th Ann Conf on Manual Control 1977 p 44-48 refs

Avail NTIS HC A20/MF A01 CSCL 05H

A representative model of the human controller in single-axis compensatory tracking tasks that exhibits an internal feedback loop which is not evident in single-loop models now in common use is presented. This hypothetical inner-loop involves a neuromuscular command signal derived from the time rate of change of controlled element output which is due to control activity. It is not contended that the single-loop human controller models now in use are incorrect but that they contain an implicit but important internal loop closure, which, if explicitly considered, can account for a good deal of the adaptive nature of the human controller in a systematic manner. J M S

**N79-17481\*#** Technische Hogeschool, Delft (Netherlands)  
 Man-Machine Systems Group  
**PARAMETER ESTIMATION IN A HUMAN OPERATOR DESCRIBING FUNCTION MODEL FOR A TWO-DIMENSIONAL TRACKING TASK**

Antonie van Lunteren / In MIT Proc 13th Ann Conf on Manual Control 1977 p 49-57 refs

Avail NTIS HC A20/MF A01 CSCL 05H

A previously described parameter estimation program was applied to a number of control tasks each involving a human operator model consisting of more than one describing function. One of these experiments is treated in more detail. It consisted of a two dimensional tracking task with identical controlled elements. The tracking errors were presented on one display as two vertically moving horizontal lines. Each loop had its own manipulator. The two forcing functions were mutually independent and consisted each of 9 sine waves. A human operator model was chosen consisting of 4 describing functions, thus taking into account possible linear cross couplings. From the Fourier coefficients of the relevant signals the model parameters were estimated after alignment averaging over a number of runs and decoupling. The results show that for the elements in the main loops the crossover model applies. A weak linear cross coupling existed with the same dynamics as the elements in the main loops but with a negative sign. J M S

**N79-17482\*#** Air Force Flight Dynamics Lab., Wright-Patterson AFB Ohio

**AN APPROACH TO THE MULTI-AXIS PROBLEM IN MANUAL CONTROL**

Walter W. Harrington / In MIT Proc 13th Ann Conf on Manual Control 1977 p 58-71 refs

Avail NTIS HC A20/MF A01 CSCL 05H

The multiaxis control problem is addressed within the context of the optimal pilot model. The problem is developed to provide efficient adaptation of the optimal pilot model to complex aircraft systems and real world multiaxis tasks. This is accomplished by establishing separability of the longitudinal and lateral control problems subject to the constraints of multiaxis attention and control allocation. Control solution adaptation to the constrained single axis attention allocations is provided by an optimal control frequency response algorithm. An algorithm is developed to solve the multiaxis control problem. The algorithm is then applied to an attitude hold task for a bare airframe fighter aircraft case with interesting multiaxis properties. J M S

**N79-17483\*#** Northrop Corp Hawthorne Calif Aircraft Group

**ERROR RATE INFORMATION IN ATTENTION ALLOCATION PILOT MODELS**

W. H. Faulkner and E. D. Onstott / In MIT Proc 13th Ann Conf on Manual Control 1977 p 72-78 refs

Avail NTIS HC A20/MF A01 CSCL 05J

The Northrop urgency decision pilot model was used in a command tracking task to compare the optimized performance of multiaxis attention allocation pilot models whose urgency functions were (1) based on tracking error alone and (2) based on both tracking error and error rate. A matrix of system dynamics and command inputs was employed to create both symmetric and asymmetric two axis compensatory tracking tasks. All tasks were single loop on each axis. Analysis showed that a model that allocates control attention through nonlinear urgency functions using only error information could not achieve performance of the full model whose attention shifting algorithm included both error and error rate terms. Subsequent to this analysis tracking performance predictions for the full model were verified by piloted flight simulation. Complete model and simulation data are presented. J M S

**N79-17484\*#** General Motors Research Labs Warren Mich  
**THE APPLICATION OF INTEGRAL PERFORMANCE CRITERIA TO THE ANALYSIS OF DISCRETE MANEUVERS IN A DRIVING SIMULATOR**

Brian S. Repa, Robert S. Zucker and Walter W. Wierwille (Va Polytechnic Inst and State Univ Blacksburg) / In MIT Proc 13th Ann Conf on Manual Control 1977 p 81-100 refs

(RS-GMR-2394) Avail NTIS HC A20/MF A01 CSCL 05H

The influence of vehicle transient response characteristics on driver-vehicle performance in discrete maneuvers as measured by integral performance criteria was investigated. A group of eight ordinary drivers was presented with a series of eight vehicle transfer function configurations in a driving simulator. Performance in two discrete maneuvers was analyzed by means of integral performance criteria. Results are presented. J M S

**N79-17485\*#** Massachusetts Inst of Tech Cambridge Dept of Mechanical Engineering

**THE FACILITATING EFFECTS OF UNCERTAINTY IN LONG-TERM MANUAL CONTROL**

William L. Verplank / In its Proc 13th Ann Conf on Manual Control 1977 p 101-117 refs

Avail NTIS HC A20/MF A01 CSCL 05H

A 40-minute tracking task with different disturbance inputs was used to look for the effects of reduced task demands on long term manual control. The expected facilitating effects of task difficulty are hard to find. The decrements in performance over the run are no greater for the easier tasks. The detrimental effects of lower demand appear to be increased relative variability in performance and possibly reduced performance on transition to unexpected more difficult tasks. An information measure

including the effects of self-induced uncertainty is developed as a work-load measure. There is a positive correlation between this 'self-induced work-load' and performance decrement for the easiest task just the opposite of what the facilitation hypothesis would predict J M S

**N79-17486\*#** Massachusetts Inst of Tech Cambridge Center for Space Research

**MULTI-ATTRIBUTE SUBJECTIVE EVALUATIONS OF MANUAL TRACKING TASKS vs OBJECTIVE PERFORMANCE OF THE HUMAN OPERATOR**

Alex Siapkaras *In its Proc 13th Ann Conf on Manual Control 1977 p 118-125 refs*

Avail NTIS HC A20/MF A01 CSCL 05J

A computational method to deal with the multidimensional nature of tracking and/or monitoring tasks is developed. Operator centered variables including the operator's perception of the task are considered. Matrix ratings are defined based on multidimensional scaling techniques and multivariate analysis. The method consists of two distinct steps: (1) to determine the mathematical space of subjective judgements of a certain individual (or group of evaluators) for a given set of tasks and experimental conditionings; and (2) to relate this space with respect to both the task variables and the objective performance criteria used. Results for a variety of second-order trackings with smoothed noise-driven inputs indicate that: (1) many of the internally perceived task variables form a nonorthogonal set; and (2) the structure of the subjective space varies among groups of individuals according to the degree of familiarity they have with such tasks J M S

**N79-17487\*#** Illinois Univ at Urbana-Champaign Urbana  
**THE EFFECTS OF PARTICIPATORY MODE AND TASK WORKLOAD ON THE DETECTION OF DYNAMIC SYSTEM FAILURES**

Christopher D Wickens and Colin Kessel *In MIT Proc 13th Ann Conf on Manual Control 1977 p 126-135 refs*

(Contract F44620-76-C-0009)

Avail NTIS HC A20/MF A01 CSCL 05H

The ability of operators to detect step changes in the dynamics of control systems is investigated as a joint function of: (1) participatory mode: whether subjects are actively controlling those dynamics or are monitoring an autopilot controlling them; and (2) concurrent task workload. A theoretical analysis of detection in the two modes identifies factors that will favor detection in either mode. Three subjects detected system failures in either an autopilot or manual controlling mode, under single-task conditions and concurrently with a subcritical tracking task. Latency and accuracy of detection were assessed and related through a speed-accuracy tradeoff representation. It was concluded that failure detection performance was better during manual control than during autopilot control and that the extent of this superiority was enhanced as dual-task load increased. Ensemble averaging and multiple regression techniques were then employed to investigate the cues utilized by the subjects in making their detection decisions. Author

**N79-17488\*#** Northrop Corp Hawthorne, Calif Aircraft Group

**PREDICTION OF PILOT RESERVE ATTENTION CAPACITY DURING AIR-TO-AIR TARGET TRACKING**

E D Onstott and W H Faulkner *In MIT Proc 13th Ann Conf on Manual Control 1977 p 136-142 refs*

Avail NTIS HC A20/MF A01 CSCL 05J

Reserve attention capacity of a pilot was calculated using a pilot model that allocates exclusive model attention according to the ranking of task urgency functions whose variables are tracking error and error rate. The modeled task consisted of tracking a maneuvering target aircraft both vertically and horizontally and when possible performing a diverting side task which was simulated by the precise positioning of an electrical stylus and modeled as a task of constant urgency in the attention allocation algorithm. The urgency of the single loop vertical task

is simply the magnitude of the vertical tracking error while the multiloop horizontal task requires a nonlinear urgency measure of error and error rate terms. Comparison of model results with flight simulation data verified the computed model statistics of tracking error of both axes: lateral and longitudinal stick amplitude and rate and side task episodes. Full data for the simulation tracking statistics as well as the explicit equations and structure of the urgency function multiaxis pilot model are presented J M S

**N79-17489\*#** Nederlands Instituut voor Praeventieve Geneeskunde TNO Leiden

**REDUCED MENTAL CAPACITY AND BEHAVIOR OF A RIDER OF A BICYCLE SIMULATOR UNDER ALCOHOL STRESS OR UNDER DUAL TASK LOAD**

Mathijs Soede *In MIT Proc 13th Ann Conf on Manual Control 1977 p 136-142 refs*

Avail NTIS HC A20/MF A01 CSCL 05J

Experiments were carried out on a bicycle simulator with alcohol administration and a binary choice task in separate sessions, intending to reduce the subject's mental capacity. Before and after such sessions a visual evoked response measurement was done. The subject's performance was analyzed with describing function techniques. The results indicate that the alcohol affects the course-following task as well as the balancing task. The binary choice task is more specifically influencing the course-following task. The dual task shows a more pronounced effect on the recovery of the evoked response. The alcohol is delaying the recovery curve of the evoked response. A tentative explanation can be given which agrees with the performance data J M S

**N79-17490\*#** Aerospace Medical Research Labs Wright-Patterson AFB Ohio

**A RELATIONSHIP BETWEEN EYE MOVEMENT PATTERNS AND PERFORMANCE IN A PRECOGNITIVE TRACKING TASK**

D W Repperger and E J Hartzell *In MIT Proc 13th Ann Conf on Manual Control 1977 p 152-161 refs*

Avail NTIS HC A20/MF A01 CSCL 05J

Eye movements made by various subjects in the performance of a precognitive tracking task are studied. The tracking task presented by an antiaircraft artillery (AAA) simulator has an input forcing function represented by a deterministic aircraft fly-by. The performance of subjects is ranked by two metrics: Good, mediocre and poor trackers are selected for analysis based on performance during the difficult segment of the tracking task and over replications. Using phase planes to characterize both the eye movement patterns and the displayed error signal, a simple metric is developed to study these patterns. Two characterizations of eye movement strategies are defined and quantified. Using these two types of eye strategies, two conclusions are obtained about good, mediocre and poor trackers. First, the eye tracker who used a fixed strategy will consistently perform better. Secondly, the best fixed strategy is defined as a Crosshair Fixator J M S

**N79-17491\*#** Forschungsinstitut fuer Anthropotechnik Meckenheim (West Germany)

**A CONTROL THEORETIC MODEL OF DRIVER STEERING BEHAVIOR**

Edmund Donges *In MIT Proc 13th Ann Conf on Manual Control 1977 p 165-171 refs*

Avail NTIS HC A20/MF A01 CSCL 05H

A quantitative description of driver steering behavior such as a mathematical model is presented. The steering task is divided into two levels: (1) the guidance level involving the perception of the instantaneous and future course of the forcing function provided by the forward view of the road and the response to it in an anticipatory open-loop control mode; (2) the stabilization level whereby any occurring deviations from the forcing function are compensated for in a closed-loop control mode. This concept of the duality of the driver's steering activity led to a newly developed two-level model of driver steering behavior. Its

parameters are identified on the basis of data measured in driving simulator experiments. The parameter estimates of both levels of the model show significant dependence on the experimental situation which can be characterized by variables such as vehicle speed and desired path curvature J M S

**N79-17492\*#** Technische Hogeschool Delft (Netherlands)  
**MODELLING THE HUMAN OPERATOR OF SLOWLY RESPONDING SYSTEMS USING LINEAR MODELS**

W Veldhuyzen /in MIT Proc 13th Ann Conf on Manual Control 1977 p 172-178 refs

Avail NTIS HC A20/MF A01 CSCL 05H

Control of slowly responding systems such as helmsman steering a large ship is examined. It is shown that the describing function techniques are useful in analyzing the control behavior of the helmsman. Models are developed to describe the helmsman's control behavior. It is shown that the cross over model is applicable to the analysis of control of slowly responding systems J M S

**N79-17493\*#** Systems Technology Inc Hawthorne Calif  
**DRIVER STEERING DYNAMICS MEASURED IN CAR SIMULATOR UNDER A RANGE OF VISIBILITY AND ROADMAKING CONDITIONS**

R Wade Allen and Duane T McRuer /in MIT Proc 13th Ann Conf on Manual Control 1977 p 180-196 refs

Avail NTIS HC A20/MF A01 CSCL 05H

A simulation experiment was conducted to determine the effect of reduced visibility on driver lateral (steering) control. The simulator included a real car cab and a single lane road image projected on a screen six feet in front of the driver. Simulated equations of motion controlled apparent car lane position in response to driver steering actions, wind gusts and road curvature. Six drivers experienced a range of visibility conditions at various speeds with assorted roadmaking configurations (mark and gap lengths). Driver describing functions were measured and detailed parametric model fits were determined. A pursuit model employing a road curvature feedforward was very effective in explaining driver behavior in following randomly curving roads. Sampled-data concepts were also effective in explaining the combined effects of reduced visibility and intermittent road markings on the driver's dynamic time delay. The results indicate the relative importance of various perceptual variables as the visual input to the driver's steering control process is changed. Author

**N79-17495\*#** Technische Hogeschool Delft (Netherlands)  
**Man-Machine Systems Group**

**A MODEL OF THE HUMAN SUPERVISOR**

Jan J Kok and Ron A vanWijk /in MIT Proc 13th Ann Conf on Manual Control 1977 p 210-216 refs

Avail NTIS HC A20/MF A01 CSCL 05J

A general model of the human supervisor's behavior is given. Submechanisms of the model include the observer/reconstructor, decision-making and controller. A set of hypothesis is postulated for the relations between the task variables and the parameters of the different submechanisms of the model. Verification of the model hypotheses is considered using variations in the task variables. An approach is suggested for the identification of the model parameters which makes use of a multidimensional error criterion. Each of the elements of this multidimensional criterion corresponds to a certain aspect of the supervisor's behavior and is directly related to a particular part of the model and its parameters. This approach offers good possibilities for an efficient parameter adjustment procedure J M S

**N79-17496\*#** National Aeronautics and Space Administration  
 Ames Research Center Moffett Field, Calif  
**THE HUMAN AS A DETECTOR OF CHANGES IN VARIANCE AND BANDWIDTH**

Renwick E Curry and T Govindaraj (Ill Univ Urbana) /in MIT

Proc 13th Ann Conf on Manual Control 1977 p 217-221 refs

(Grant NGR-22-009-733)

Avail NTIS HC A20/MF A01 CSCL 05J

The detection of changes in random process variance and bandwidth was studied. Psychophysical thresholds for these two parameters were determined using an adaptive staircase technique for second order random processes at two nominal periods (1 and 3 seconds) and damping ratios (0.2 and 0.707). Thresholds for bandwidth changes were approximately 9% of nominal except for the (3sec 0.2) process which yielded thresholds of 12%. Variance thresholds averaged 17% of nominal except for the (3sec 0.2) process in which they were 32%. Detection times for suprathreshold changes in the parameters may be roughly described by the changes in RMS velocity of the process. A more complex model is presented which consists of a Kalman filter designed for the nominal process using velocity as the input and a modified Wald sequential test for changes in the variance of the residual. The model predictions agree moderately well with the experimental data. Models using heuristics, e.g. level crossing counters, were also examined and are found to be descriptive but do not afford the unification of the Kalman filter/sequential test model used for changes in mean J M S

**N79-17503\*#** CAE Electronics Ltd Montreal (Quebec)  
**MULTI-AXIS HAND CONTROLLER FOR THE SHUTTLE REMOTE MANIPULATOR SYSTEM**

Andrew L Lippay /in MIT Proc 13th Ann Conf on Manual Control 1977 p 285-288

Avail NTIS HC A20/MF A01 CSCL 05H

The Shuttle Remote Manipulator System has a articulated arm of 50 ft length with six motor-driven joints. The basic purpose is to establish physical contact with various space hardware items and maneuver these to the desired position and attitude with respect to the Orbiter, nulling out relative velocities and stabilizing the free-body system by managing residual energies. The normal operating mode is resolved-motion end-point rate control by man-in-loop command. The translational freedoms are defined so that the End Effector (EEFTR) of the arm will move in planes parallel to the principal translational planes of the Orbiter at a rate commanded by the displacement of the Translation Hand Controller in the corresponding freedom and direction. The rotational freedoms are rate-controlled by the Rotation Hand Controller about pivot axes parallel to Orbiter roll, pitch and yaw originating at the EEFTR reference point. L S

**N79-17504\*#** Stanford Univ Calif Dept of Industrial Engineering

**THE DEVELOPMENT OF A SIX DEGREE-OF-CONSTRAINT ROBOT PERFORMANCE EVALUATION TEST**

David A Thompson /in MIT Proc 13th Ann Conf on Manual Control 1977 p 289-292 ref

Avail NTIS HC A20/MF A01 CSCL 05H

A remote manipulator performance evaluation test was developed to test certain tool mating configurations not possible with the standard peg-in-hole type of test. The test attempted to evaluate robot manipulator performance over a full range of six degrees of freedom of motion between a tool and its intended receptacle. The test consists primarily of four different tool geometries and three different receptacle geometries which provide for a progressive reduction in the degrees of freedom of motion and a progressive increase in the degrees of constraint (DOC) over motion between the tool and the receptacle. The manipulation times of actual tools and couplings would be predicted by the times for the test tool most like it geometrically. In addition the influence of four different transmission delays was tested. The results indicate that tool manipulation time can vary by a factor of about four depending on the degrees of constraint over final tool positioning. L S

**N79-17505\*#** Tufts Univ Medford Mass  
**PROSTHETIC EMG CONTROL ENHANCEMENT THROUGH**

**THE APPLICATION OF MAN-MACHINE PRINCIPLES**

W A Simcox /In MIT Proc 13th Ann Conf on Manual Control 1977 p 258-265 refs

Avail NTIS HC A20/MF A01 CSCL 05H

An area in medicine that appears suitable to man-machine principles is rehabilitation research, particularly when the motor aspects of the body are involved. If one considers the limb, whether functional or not as the machine, the brain as the controller and the neuromuscular system as the man-machine interface, the human body is reduced to a man-machine system that can benefit from the principles behind such systems. The area of rehabilitation that this paper deals with is that of an arm amputee and his prosthetic device. Reducing this area to its man-machine basics, the problem becomes one of attaining natural multiaxis prosthetic control using Electromyographic activity (EMG) as the means of communication between man and prosthesis. In order to use EMG as the communication channel it must be amplified and processed to yield a high information signal suitable for control. The most common processing scheme employed is termed Mean Value Processing. This technique for extracting the useful EMG signal consists of a differential to single ended conversion to the surface activity followed by a rectification and smoothing. L S

**N79-17506\*# SRI International Corp., Menlo Park, Calif**  
**TWO MEASURES OF PERFORMANCE IN A PEG-IN-HOLE MANIPULATION TASK WITH FORCE FEEDBACK**

John W Hill /In MIT Proc., 13th Ann Conf on Manual Control 1977 p 301-309 refs

(Contract NAS2-8652)

Avail NTIS HC A20/MF A01 CSCL 05J

The results are described from two manipulators on a peg-in-hole task which is part of a continued effort to develop models for human performance with remote manipulators. Task difficulty is varied by changing the diameter of the peg to be inserted in a 50 mm diameter hole. An automatic measuring system records the distance between the tool being held by the manipulator and the receptacle into which it is to be inserted. The data from repeated insertions are processed by computer to determine task times, accumulated distances, and trajectories. Experiments with both the MA-11 cable-connected master-slave manipulator common to hot cell work and the MA-23 servo-controlled manipulator (with and without force feedback) are described. Comparison of these results with previous results of the Ames Manipulator shows that force feedback provides a consistent advantage. L S

**N79-17507\*# Analytic Sciences Corp., Reading, Mass**  
**PREDICTION OF PILOT-AIRCRAFT STABILITY BOUNDARIES AND PERFORMANCE CONTOURS**

Robert F Stengel and John R Broussard /In MIT Proc., 13th Ann Conf on Manual Control 1977 p 313-320 refs

(Contract N00014-75-C-0432)

Avail NTIS HC A20/MF A01 CSCL 05H

Control-theoretic pilot models can provide important new insights regarding the stability and performance characteristics of the pilot-aircraft system. Optimal-control pilot models can be formed for a wide range of flight conditions suggesting that the human pilot can maintain stability if he adapts his control strategy to the aircraft's changing dynamics. Of particular concern is the effect of sub-optimal pilot adaptation as an aircraft transitions from low to high angle-of-attack during rapid maneuvering as the changes in aircraft stability and control response can be extreme. This paper examines the effects of optimal and sub-optimal effort during a typical high-g maneuver and it introduces the concept of minimum-control effort (MCE) adaptation. Limited experimental results tend to support the MCE adaptation concept. Author

**N79-17508\*# Office National d'Etudes et de Recherches Aeronautiques Paris (France)**  
**DISCRETE TIME MODELING OF HEAVY TRANSPORT PLANE PILOT BEHAVIOR**

Daniel Cavalli /In MIT Proc 13th Ann Conf on Manual Control 1977 p 321-328 refs

Avail NTIS HC A20/MF A01 CSCL 05J

The desire to improve flight safety leads to a classification of various flight troubles in three groups: (1) troubles from sensitivity to flight disturbances, (2) maneuverability troubles (whenever a correction maneuver induces an unexpected deviation on another parameter), and (3) pilot troubles (pilot overload when required attention is excessive or underload entailing a loss of vigilance). Sensitivity to disturbances and maneuverability of a given aircraft may be evaluated from the early design stage. Evaluation of the pilot behavior, however, may be realized only in actual flight or with a flight simulator that is quite late in the development period. For this reason, it is desirable to have available, at the design stage, a model of the pilot behavior to command the differential system describing the envisioned aircraft. This aim implies two major requirements. First, the program must be compatible with a wide range of possible aircraft designs; ideally, the program should be self-learning. Second, mental load and overall pilot performance must be modeled. L S

**N79-17510\*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio**

**USE OF THE OPTIMAL CONTROL MODEL IN THE DESIGN OF MOTION CUE EXPERIMENTS**

Andrew M Junker and William H Levison /In MIT Proc 13th Ann Conf on Manual Control 1977 p 353-360 refs. Prepared in cooperation with Bolt, Beranek and Newman, Inc., Cambridge Mass.

Avail NTIS HC A20/MF A01 CSCL 05J

An experiment is presented in which the effects of roll motions on human operator performance were investigated. The motion cues considered were the result of commanded vehicle motion and vehicle disturbances. An optimal control pilot-vehicle model was used in the design of the experiment and to predict system performance prior to executing the experiment. The model predictions and experimental results are compared. Seventy-eight per cent of the model predictions are within one standard deviation of the means of the experimental results. The high correlation between model predictions and system performance indicates the usefulness of the predictive model for experimental design and for prediction of pilot performance influenced by motion cues. Author

**N79-17511\*# Computer Sciences Corp., Mountain View, Calif**  
**THE EFFECT OF A VISUAL/MOTION DISPLAY MISMATCH IN A SINGLE AXIS COMPENSATORY TRACKING TASK**

Douglas K Shirachi and Richard S Shirley /In MIT Proc 13th Ann Conf on Manual Control 1977 p 361-376 refs

(Contract NAS2-7806)

Avail NTIS HC A20/MF A01 CSCL 05J

The frequency response of visual systems is typically unity from 0 to 20 rad/sec while that of motion systems typically falls off in the vicinity of 6 rad/sec. The question arises as to what effect if any such a difference in servomechanism performance has on the simulation. Is pilot performance reduced by the conflict between displays? Would a more realistic simulation occur if the visual servomechanisms were degraded to match the motion servomechanisms? Does the pilot need and use the higher frequency information present in the visual display? The purpose of the experiment is to take a step forward toward answering these questions. Work already in the literature which bears on these questions is outlined. A description is then given of an experiment used to check for the effects of a difference in the performance of the visual and motion servomechanisms (the experiment uses a single-axis, compensatory roll-tracking task). The results of the experiment are then presented and analyzed. L S

**N79-17512\*# Bolt, Beranek and Newman, Inc., Cambridge, Mass**  
**A MODEL FOR THE PILOT'S USE OF MOTION CUES IN**

**ROLL-AXIS TRACKING TASKS**

William H Levison and Andrew M Junker (Aerospace Med Res Lab) *In* MIT Proc 13th Ann Conf on Manual Control 1977 p 377-388 refs

Avail NTIS HC A20/MF A01 CSCL 05J

Simulated target-following and disturbance-regulation tasks were explored with subjects using visual-only and combined visual and motion cues. The effects of motion cues on task performance and pilot response behavior were appreciably different for the two task configurations and were consistent with data reported in earlier studies for similar task configurations. The optimal-control model for pilot/vehicle systems provided a task-independent framework for accounting for the pilot's use of motion cues. Specifically, the availability of motion cues was modeled by augmenting the set of perceptual variables to include position rate, acceleration and acceleration-rate of the motion simulator, and results were consistent with the hypothesis of attention-sharing between visual and motion variables. This straightforward informational model allowed accurate model predictions of the effects of motion cues on a variety of response measures for both the target-following and disturbance-regulation tasks. LS

**N79-17513\*#** Massachusetts Inst of Tech Cambridge Dept of Aeronautics and Astronautics

**MANUAL CONTROL OF YAW MOTION WITH COMBINED VISUAL AND VESTIBULAR CUES**

Greg L Zacharias and Laurence R Young *In* its Proc 13th Ann Conf on Manual Control 1977 p 389-402 refs Sponsored in part by Natl Inst of Health

(Grant NsG-2032)

Avail NTIS HC A20/MF A01 CSCL 05J

Measurements are made of manual control performance in the closed-loop task of nulling perceived self-rotation velocity about an earth-vertical axis. Self-velocity estimation was modeled as a function of the simultaneous presentation of vestibular and peripheral visual field motion cues. Based on measured low-frequency operator behavior in three visual field environments, a parallel channel linear model is proposed which has separate visual and vestibular pathways summing in a complementary manner. A correction to the frequency responses is provided by a separate measurement of manual control performance in an analogous visual pursuit nulling task. The resulting dual-input describing function for motion perception dependence on combined cue presentation supports the complementary model, in which vestibular cues dominate sensation at frequencies above 0.05 Hz. The describing function model is extended by the proposal of a non-linear cue conflict model in which cue weighting depends on the level of agreement between visual and vestibular cues.

Author

**N79-17514\*#** Tokyo Univ (Japan) Dept of Aeronautics  
**MOTION CUE EFFECTS ON HUMAN PILOT DYNAMICS IN MANUAL CONTROL**

Kyuichiro Washizu, Keiji Tanaka (Natl Aerospace Lab Tokyo), Shinsuke Endo (Ministry of Transportation, Osaka, Japan) and Toshiyuki Itoko (Kawasaki Heavy Ind Co Akashi Japan) *In* MIT Proc 13th Ann Conf on Manual Control 1977 p 403-413 refs

Avail NTIS HC A20/MF A01 CSCL 05J

Two experiments were conducted to study the motion cue effects on human pilots during tracking tasks. The moving-base simulator of National Aerospace Laboratory was employed as the motion cue device and the attitude director indicator or the projected visual field was employed as the visual cue device. The chosen controlled elements were second-order unstable systems. It was confirmed that with the aid of motion cues the pilot workload was lessened and consequently the human controllability limits were enlarged. In order to clarify the mechanism of these effects, the describing functions of the human pilots were identified by making use of the spectral and the time domain analyses. The results of these analyses suggest that the sensory system of the motion cues can yield the differential informations of the signal effectively, which coincides with the existing knowledges in the physiological area. LS

**N79-17515\*#** National Aeronautics and Space Administration Langley Research Center, Hampton, Va

**STUDY OF THE USE OF A NONLINEAR, RATE LIMITED, FILTER ON PILOT CONTROL SIGNALS**

James J Adams *In* MIT Proc 13th Ann Conf on Manual Control 1977 p 417-438 refs

Avail NTIS HC A20/MF A01 CSCL 05J

The use of a filter on the pilot's control output could improve the performance of the pilot-aircraft system. What is needed is a filter with a sharp high frequency cut-off, no resonance peak and a minimum of lag at low frequencies. The present investigation studies the usefulness of a nonlinear rate limited, filter in performing the needed function. The nonlinear filter is compared with a linear first order filter and no filter. An analytical study using pilot models and a simulation study using experienced test pilots was performed. The results showed that the nonlinear filter does promote quick steady maneuvering. It is shown that the nonlinear filter attenuates the high frequency remnant and adds less phase lag to the low frequency signal than does the linear filter. It is also shown that the rate limit in the nonlinear filter can be set to be too restrictive causing an unstable pilot-aircraft system response. LS

**N79-17516\*#** Ohio State Univ Columbus Human Performance Center

**EVALUATION OF KINESTHETIC-TACTUAL DISPLAYS USING A CRITICAL TRACKING TASK**

Richard J Jagacinski, Dwight P Miller, Richard D Gilson and Robert T Ault *In* MIT Proc 13th Ann Conf on Manual Control 1977 p 439-446 refs

(Grant NsG-2179)

Avail NTIS HC A20/MF A01 CSCL 05H

The study sought to investigate the feasibility of applying the critical tracking task paradigm to the evaluation of kinesthetic-tactual displays. Four subjects attempted to control a first-order unstable system with a continuously decreasing time constant by using either visual or tactual unidimensional displays. Display aiding was introduced in both modalities in the form of velocity quickening. Visual tracking performance was better than tactual tracking and velocity aiding improved the critical tracking scores for visual and tactual tracking about equally. The results suggest that the critical task methodology holds considerable promise for evaluating kinesthetic-tactual displays. LS

**N79-17517\*#** Forschungsinstitut fuer Anthropotechnik Bonn (West Germany)

**INFLUENCES OF JOYSTICK SPRING RESISTANCE ON THE EXECUTION OF SIMPLE AND COMPLEX POSITIONING MOVEMENTS**

Guenter Rothbauer *In* MIT Proc 13th Ann Conf on Manual Control 1977 p 447-451 refs

Avail NTIS HC A20/MF A01 CSCL 05H

To provide good proprioceptive feedback in a manual control device for a designation task, spring resistance of a joystick was optimized by adjustment of centering force and deflection nonlinearly with each other by using the psychophysical method of cross modality matching. Designation with zero and first order systems showed that the coarse adjustment was insensitive to stick and certain task parameters, although it was influenced by some biomechanical parameters and the anticipated demands of the final control positioning. Only the more difficult fine adjustment is sensitive to parameter alterations and therefore suitable for optimization attempts. The strong centering of the stick by a nonlinear degressive spring resistance facilitates fine adjustment. Through this total adjustment time with the first order system is reduced by more than thirty percent, compared to a linear resistance. Tracking experiments affirm the usefulness and preference of nonlinear spring resistance. Author

**N79-17519\*#** National Aeronautics and Space Administration Ames Research Center Moffett Field Calif

**SPEECH AS A PILOT INPUT MEDIUM**



R P Plummer (Utah Univ) and C R Coler /in MIT Proc 13th Ann Conf on Manual Control 1977 p 460-462 refs

(Grant NGR-45-003-108)

Avail NTIS HC A20/MF A01 CSCL 05H

The speech recognition system under development is a trainable pattern classifier based on a maximum-likelihood technique. An adjustable uncertainty threshold allows the rejection of borderline cases for which the probability of misclassification is high. The syntax of the command language spoken may be used as an aid to recognition and the system adapts to changes in pronunciation if feedback from the user is available. Words must be separated by 25 second gaps. The system runs in real time on a mini-computer (PDP 11/10) and was tested on 120 000 speech samples from 10- and 100-word vocabularies. The results of these tests were 99.9% correct recognition for a vocabulary consisting of the ten digits and 99.6% recognition for a 100-word vocabulary of flight commands with a 5% rejection rate in each case. With no rejection, the recognition accuracies for the same vocabularies were 99.5% and 98.6% respectively. LS

**N79-17520\*** Illinois Univ at Chicago Circle Chicago Coll of Engineering

**A QUASI-LINEAR CONTROL THEORY ANALYSIS OF TIMESHARING SKILLS**

Gyan C Agarwal and Gerald L Gottlieb /in MIT Proc 13th Ann Conf on Manual Control 1977 p 463 refs Prepared in cooperation with Rush-Presbyterian-Saint Luke's Med Center Chicago

(Grants NSF ENG-76-08754 NINCDS-NS-00196)

Avail NTIS HC A20/MF A01 CSCL 05H

The compliance of the human ankle joint is measured by applying 0 to 50 Hz band-limited gaussian random torques to the foot of a seated human subject. These torques rotate the foot in a plantar-dorsal direction about a horizontal axis at a medial malleolus of the ankle. The applied torques and the resulting angular rotation of the foot are measured, digitized and recorded for off-line processing. Using such a best-fit second-order model the effective moment of inertia of the ankle joint, the angular viscosity and the stiffness are calculated. The ankle joint stiffness is shown to be a linear function of the level of tonic muscle contraction, increasing at a rate of 20 to 40 Nm/rad/Kg m of active torque. In terms of the muscle physiology, the more muscle fibers that are active, the greater the muscle stiffness. Joint viscosity also increases with activation. Joint stiffness is also a linear function of the joint angle, increasing at a rate of about 0.7 to 1.1 Nm/rad/deg from plantar flexion to dorsiflexion. LS

**N79-17521\*** Canada Inst for Scientific and Technical Information Ottawa (Ontario)

**GEL-ELECTROPHORESIS STUDIES FOR THE TAXONOMIC CHARACTERIZATION OF SOIL MICROORGANISMS**

Krisztina PechyneKoeves and Kalman Szende 1979 17 p refs Transl into ENGLISH from Agrartud Kozlemen (Hungary) v 33 no 1, 1974 p 65-76

(NBC/CNR-TT-1924, ISSN-0077-5606) Avail NTIS HC A02/MF A01

The investigations showed that gel-electrophoresis can be employed to determine genetic relationships within the Rhizobium gene as well as among those of linked genes. It was demonstrated that the genetic relationships obtained from relatively small number of samples, are in agreement with the groups based phenotypic similarities both for proteins and for dehydrogenases. The method can be applied in soil ecosystem population studies, e.g. when mutagenic pesticides have accumulated in the soil and their effect on different species or gene-pools is to be detected. G Y

**N79-17522\*** Howard Univ Washington D C Dept of Chemistry

**RAMAN AND INFRARED INVESTIGATIONS OF THE NATURE OF INTRACELLULAR WATER**

George E Walrafen 17 Oct 1978 25 p refs (Contract N00014-78-C-0192)

(AD-A061254 TR-1) Avail NTIS HC A02/MF A01 CSCL 06/1

The collagen fibers were immersed in water for 12 hr. The surface water was next rigorously removed with tissue and the fibers air dried for 10 min. The fibers were then weighed. This weight corresponded to zero desiccating time. Next the fibers were desiccated for 16 hr over P2O5 under vacuum and reweighed. The fibers and this procedure was repeated every 16 hr until 136 hr had elapsed. The rapid fall within 0 to 16 hr could, of course, result from the rapid loss of surface water or other loosely held water. However, some evidence to the contrary may arise from infrared spectra shown next. All infrared spectra were obtained at increments of 16 hr desiccating time. The first infrared spectra corresponded to zero time. GRA

**N79-17523\*** Research Inst of National Defence Stockholm (Sweden)

**EFFECT ON MICE OF MICROWAVES IN THE NON-THERMAL INTENSITY REGION: RESPIRATION, RECTAL TEMPERATURE AND MENTAL REACTION [INVERKAN PAA MOESS AV MIKROVAAGOR INOM DETICKETER-MISKA INTENSITETSSOMRAADET ANDNING, REKTALTEMPERATUR OCH SINNESREAKTION]**

C O Cnborn Jan 1978 23 p refs In SWEDISH

(FOA-C-54021-H2(H6)) Avail NTIS HC A02/MF A01

The effect of microwaves (2450 MHz) on respiration, rectal temperature and mental reaction to sound was studied using an intensity of 10 mW/sq cm for 30 minutes. The result shows that both respiration and reaction to sound deteriorated during exposure, while the rectal temperature was unaffected. Previous investigations carried out in the same way but at an intensity of 100 mW/sq cm for three minutes provided the opportunity to study the relationship between doses for two different intensities and a total dose of 300 mW min/sq cm. It is shown that initially the respiration volume per minute decreases during exposure at both intensities but that thermoregulation is cut out after approximately two minutes exposure at 100 mW/sq cm. This leads to a rise in rectal temperature. At 10 mW/sq cm the rise in temperature is counteracted throughout the exposure period by a decrease in the respiration volume per minute. The value of the reaction to sound, normalized to the respiration volume per minute, is affected at both intensities. J M S

**N79-17524\*** Medical Biological Lab RVO-TNO Rijswijk (Netherlands)

**EARLY DIAGNOSIS FOR DECOMPRESSION SICKNESS: CHANGES IN THE BLOOD FOUND SHORTLY AFTER DECOMPRESSION. PART 2. EXPERIMENTS ON RATS**

M Wijnans, P M Draeck, and P Vaneck Jul 1978 32 p refs In DUTCH, ENGLISH summary

(Contract A76/KM/017)

(MBL-1978-7 TDCK-71223) Avail NTIS HC A03/MF A01

In rats subjected to compression followed by decompression, hemoconcentration was observed which was related to the severity of the applied compression-decompression procedure. In nearly all cases this hemoconcentration became apparent before signs of decompression-sickness were observed. Hemoconcentration occurred even in rats without symptoms. In a relatively large number of rats a drop in platelet count was noticed soon after decompression but usually only after the platelet count was corrected for the hemoconcentration. It was found that in rats, a rise in hematocrit had the highest prognostic value for the occurrence of symptoms of decompression sickness. Recommendations are given for an investigation of the possible prognostic value of hemoconcentration in divers. G Y

**N79-17525\*** Rosenstiel Schol of Marine and Atmospheric Sciences, Miami, Fla Div of Biology and Living Resources  
**NITROGEN FIXATION WITH PHOTOSYNTHETIC MARINE MICROORGANISMS** Progress Report, 15 Feb - 30 Aug 1978

Akira Mitsui 1978 51 p

(Grant NSF AER-76-17159)

(PB-287590/4 NSF/RA-780273)

Avail NTIS

HC A04/MF A01 CSCL 06M

An attempt is made to develop a system for the mass culturing of nitrogen-fixing marine photosynthetic microorganisms that could be applicable to food and fertilizer production. The system should

be capable of providing food without the use of combined nitrogen but with solar radiation as the principle source of energy and salt water as the base for these organisms. A 3 year work plan divided into 5 steps was implemented to achieve these goals. A variety of organisms were collected and cultured under varying conditions and some isolations of N-fixing organisms have taken place. Studies of algal strains indicate that there are blue-green algae available for culturing under nitrogen-free conditions in a wide range of salt water environments and some of these strains show definite potential applications as food or food additives. Aquaculture studies using invertebrates as test animals, where initiated and toxicity tests were performed using bioassays and blood hemolysis techniques. GRA

**N79-17526#** Joint Publications Research Service, Arlington, Va

**TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY BIOMEDICAL AND BEHAVIORAL SCIENCES, NO 57**

12 Feb 1979 50 p refs. Transl into ENGLISH from various Russian journals

(JPRS-72808) Copyright Avail NTIS HC A03/MF A01

The effects of pollution, radiation, and flight stress on biological species are assessed and methods for their measurement and prediction are examined.

**N79-17527#** Joint Publications Research Service, Arlington, Va

**COMPARATIVE STUDY OF ACETYLCHOLINESTERASE INACTIVATION IN WARM-BLOODED ANIMALS AND INSECTS WITH SUBSTITUTED VINYL PHOSPHATES**

H V Pisotska, V S Petrenko, L F Kasukhin and Yu G Gololobov. *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 57 (JPRS 72808) 12 Feb 1979 p 1-5 refs. Transl into ENGLISH from Dopov Akad Nauk Ukr RSR (Kiev), no 11 1978 p 1032-1034.

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The influence of alpha-screening on the kinetics of inhibition by vinyl phosphates of ACE activity in the heads of common houseflies *in vitro* was investigated. Inhibition involves a two-stage diagram with primary inverse coordination of the inhibitor and esterase and subsequent phosphorylation of the active center of the enzyme in the intermediate complex. The rate of enzyme inhibition was determined on an autotitrator in combination with a potentiometer. The Michaelis constant of enzymatic breakup of phenylacetate was determined to be  $(7.62 \pm 0.93)$  to the minus 10th power mole/l. Erythrocytes from human blood with a specific gravity of 2.3E and ACE extracted with a saline solution from homogenate of the heads of three-day houseflies were used for *in vitro* experiments. Kinetic parameters of ACE inhibition by substituted vinyl phosphates and their toxicological properties are presented in tables. A R H

**N79-17528#** Joint Publications Research Service, Arlington, Va

**ENVIRONMENT MONITORING IN THE USSR AND HYGIENIC PRACTICE**

A P Shitskova. *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 57 (JPRS-72808) 12 Feb 1979 p 6-10. Transl into ENGLISH from Gig Sant (Moscow) no 12, 1978 p 3-6.

Copyright Avail NTIS HC A03/MF A01

Early changes in the functional states of different human organs and systems have great significance when changes in environmental quality occur. Principles for evaluating the anthropogenic effects of pollution on man, and on his health and morbidity must be defined, standardized and systematized. Existing systems for environmental monitoring in the Soviet Union yield data used in the preparation of sanitary specifications which are applied in the optimization and amelioration of the environment. The planned global system of environmental monitoring will provide regular information about changes in different parameters of the environment and different elements of ecological systems that are due to common global changes.

A R H

**N79-17529#** Joint Publications Research Service, Arlington, Va

**ERGONOMICS LABORATORY STUDIES PILOTS' STABILITY FOR COMMAND**

I I Inin. *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci No 57 (JPRS-72808) 12 Feb 1979 p 11-12. Transl into ENGLISH from Vozdushnyy Transport (Moscow), 30 Dec 1978 p 3.

Copyright Avail NTIS HC A03/MF A01

Following an exercise in a flight simulator, an instructor can give an immediate evaluation of a pilot's actions but cannot guess the potential capabilities of the pilot or predict the pilot's future as the commander of an airliner. However, by attaching the electrodes of an electro-cardiograph to the muscles of the hands, torso, legs and head of a pilot, a doctor may study the pilot's reaction and psychophysiological state during simulated special flight situations and ascertain his ability to stay cool in unforeseen situations. A R H

**N79-17530#** Joint Publications Research Service, Arlington, Va

**INTESTINAL AUTOFLORA AS AN INDICATOR OF SEVERITY OF RADIATION LESION**

V N Maltsev and B V Pinegin. *In its* Transl on USSR Sci and Technol Biomed and Behavioral Sci, no 57 (JPRS-72808) 12 Feb 1979 p 17-22 refs. Transl into ENGLISH from Zh Mikrobiol, Epidemiol Immunobiol (Moscow), no 12 1978 p 10-14.

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Statistical analysis of data from researchers who used three radiation doses in their studies of intestinal microflora demonstrates that (1) there is a functional correlation between radiation dosage and number of autoflora microorganisms, (2) a high correlation exists between radiation dosage and the effect it elicits, and (3) the accuracy of determined radiation dosages can be evaluated. Microbiological methods can be used to prognosticate the severity of the course of radiation sickness and to quantitatively evaluate the efficacy of therapeutic and preventative measures instituted in the presence of this disease.

A R H

**N79-17531#** National Inst for Personnel Research, Johannesburg (South Africa)

**HEART RATE PHYSIOLOGICAL CHARACTERISTICS AND QUANTIFICATION METHODS FOR USE IN BEHAVIORAL STUDIES**

Elmien Spies. Dec 1977 60 p refs. (CSIR-SR-PERS-276, ISBN-0-7988-1281-8) Avail NTIS HC A04/MF A01

A literature survey is reported that covers the specific characteristics of autonomic functions in general and heart rate in particular as well as the methods used to quantify the heart rhythm. Established physiological facts that were taken into account are for instance Lacey's autonomic response pattern hypothesis, Wilder's law of initial value and the phenomenon of sinus arrhythmia. G G

**N79-17532\*#** Houston Univ, Tex Dept of Chemistry  
**EARLY DETECTION OF DISEASE THE CORRELATION OF THE VOLATILE ORGANIC PROFILES FROM PATIENTS WITH UPPER RESPIRATORY INFECTIONS WITH SUBJECTS OF NORMAL PROFILES Final Report**

Albert Zlatkis. Jan 1979 83 p refs. (Contract NAS9-14629) (NASA-CR-160100) Avail NTIS HC A05/MF A01 CSCI 06E

A method is described whereby a transelevator is used for sampling 60-100 microns of aqueous sample. Volatiles are stripped from the sample either by a stream of helium and collection on a porous polymer, Tenax, or by 0.8 ml of 2-chloropropane and collected on glass beads. The volatiles are thermally desorbed into a precolumn which is connected to a capillary gas chromatographic column for analysis. The technique is shown to be reproducible and suitable for determining chromatographic profiles for a wide variety of sample types. Using a transelevator

sampling technique the volatile profiles from 70 microns of serum were obtained by capillary column gas chromatography. The complex chromatograms were interpreted by a combination of manual and computer techniques and a two peak ratio method devised for the classification of normal and virus infected sera. Using the K-Nearest Neighbor approach 85.7 percent of the unknown samples were classified correctly. Some preliminary results indicate the possible use of the method for the assessment of virus susceptibility. Author

**N79-17533\*** National Aeronautics and Space Administration Washington, D C

#### MAN IN SPACE AND ON EARTH

A Burnazyan Jan 1979 7 p Transl into ENGLISH from Pravda (Moscow) 12 Jan 1979 7 p Transl by SCITRAN, Santa Barbara, Calif  
(Contract NASw-3198)  
(NASA-TM-75602) Avail NTIS HC A02/MF A01 CSCL 06P

The medical experience gained from flights of Soviet spacecraft is discussed. New medical methods used on these flights are described. Author

**N79-17534** Boston Univ Mass School of Medicine

#### AIR TRAFFIC CONTROLLER HEALTH CHANGE STUDY

Robert M Rose (Texas Univ Med Branch Galveston) C David Jenkins and Michael W Hurst Dec 1978 829 p refs  
(Contract DOT-FA73WA-3211)  
(FAA-AM-78-39) Avail NTIS HC A99/MF A01

The nature and extent of health changes in the Air Traffic Controllers and the characteristics by which these health changes might be predicted was studied. F O S

**N79-17535** Los Alamos Scientific Lab N Mex

#### ESTIMATING PERCENTILES OF NONNORMAL ANTHROPOMETRIC POPULATIONS Final Report

H F Martz Jr Oct 1978 13 p refs  
(Contract N63126-77-M-0154)  
(AD-A061151 PMTC-TP-78-19 PMTC-TTU-BIOTECH-78-02)  
Avail NTIS HC A02/MF A01 CSCL 12/2

The most commonly used method for estimating percentiles of anthropometric populations is based on the assumption that the population is normally distributed. This assumption is approximately true for many such variables, e.g. hip breadth. On the other hand numerous nonnormally distributed anthropometric populations are known to exist, e.g. grip strength. The question of how to estimate percentiles of nonnormal populations is addressed here. A nonparametric percentile estimation method based on the use of a kernel-type probability density function estimator is presented. A nonparametric method is defined as a method that does not make or require any assumption about the statistical distribution of the underlying population. Thus, the method can be applied to any population of anthropometric data, regardless of the normality of the data. The method is simple to use; however, a single nonlinear equation must be numerically solved on a computer by any one of numerous well-documented nonlinear root finding methods. Two examples are used to illustrate the method. In the first example selected samples of size 50 of hip breadth data are randomly drawn from a population of size 2420 observations from the 1967 anthropometric survey of U S Air Force flying personnel. The proposed method is compared to the standard Gaussian method. Since this population was selected as normally distributed, the standard method outperforms the proposed nonparametric method. In the case of grip-strength data the proposed method yields more accurate estimates in a mean squared error sense of the upper percentiles of this population. GRA

**N79-17536** Medical Biological Lab RVO-TNO Rijswijk (Netherlands)

#### CHEMICAL PROTECTION AGAINST IONIZING RADIATION A SURVEY OF POSSIBLE MECHANISMS

J J VanHemmen Dec 1977 26 p refs In DUTCH ENGLISH summary  
(Contract A76/K/100)  
(MBL-1977-8) Avail NTIS HC A03/MF A01

A survey is given of the hypotheses which have been proposed

to explain the protecting (and sensitizing) actions of chemical substances towards ionizing radiation. G G

**N79-17537** Research Inst of National Defence Stockholm (Sweden)

#### TASK COMPLEXITY AND 24-HR PERFORMANCE PATTERNS IN MORNING AND EVENING ACTIVE SUBJECTS

Jan E Froeberg Jul 1978 16 p refs  
(FOA-C-52001-H6) Avail NTIS HC A02/MF A01

One morning active and one evening active group of subjects were deprived of sleep for 72 hours. Measures of performance in a coding task were obtained at three different levels of complexity and in conditions with an incentive or an auditory disturbance respectively. The results showed that complexity of the task did not affect 24 hour patterns in performance while the other two conditions tended to enhance performance in the morning hours and this was especially pronounced in the morning active group. Author

**N79-17538** Institute for Perception RVO-TNO Soesterberg (Netherlands)

#### THE WANT AND FEASIBILITY TO TEMPER SUNLIGHT FOR THE EYES

J J Vos 1977 32 p refs In DUTCH ENGLISH summary  
(Contract A77/K/021)  
(IZF-1977-21 TDCK-70156) Avail NTIS HC A03/MF A01

The complex phenomena of glare is discussed. It is demonstrated that the domain between 10 and 1000 cd/sq m is optimal for the perception of fine detail. Ideas are formulated about the mechanism of dazzle and its possible meaning as a warning against ocular damage. Conclusions are drawn in terms of specific technical requirements for sunglasses. J M S

**N79-17539** Institute for Perception RVO-TNO, Soesterberg (Netherlands)

#### SUNGLASSES FOR DRIVERS?

J J Vos 1977 11 p ref In DUTCH ENGLISH summary  
(Contract A77/K/021)  
(IZF-1977-24 TDCK-70263) Avail NTIS HC A02/MF A01

After surveying the need for sunglasses, of tractor drivers in particular two questions were considered: (1) Are sunglasses beneficial to performance? and (2) Can examples be given of procurement of sunglasses by employers? The answer to both questions was affirmative. It is concluded that central procurement to qualified personnel can be considered as appropriate practice. Requirements were formulated both for sunglasses and for potential recipients. J M S

**N79-17540** Medical Biological Lab RVO-TNO, Rijswijk (Netherlands)

#### CHEMICAL PROTECTION AGAINST IONIZING RADIATION A SURVEY OF POSSIBLE MECHANISMS

J J vanHemmen Dec 1977 27 p refs In DUTCH ENGLISH summary  
(MBL-1977-8 TDCK-70212) Avail NTIS HC A03/MF A01

A survey is given of the hypotheses which have been proposed to explain the protecting (and sensitizing) action of chemical substances towards ionizing radiation. J M S

**N79-17541** Medical Biological Lab RVO-TNO Rijswijk (Netherlands)

#### EVALUATION OF THE RISKS INVOLVED IN THE APPLICATION OF TRITIUM GAS AND MEASURES WHICH HAVE TO BE TAKEN

G P vanderSchans and J B T Aten Jun 1978 23 p refs In DUTCH ENGLISH summary  
(Contract A76/K/023)  
(MBL-1978-6 TDCK-70889) Avail NTIS HC A02/MF A01

The risks involved in applying Tritium, a radioactive isotope of hydrogen that emits soft beta-rays to luminous paints, light sources, and spark gaps are evaluated. Circumstances in which persons are exposed to excessive irradiation, ventilation and recycling of air are among the factors covered. Safety measures such as the installation of a well-functioning ventilation system or - if an incident has already taken place - an estimation of

the dose received by means of wipe-tests air-sampling and urine-tests are also discussed J M S

**N79-17542#** Prins Maurits Lab TNO Rijswijk (Netherlands)  
**PERCUTANEOUS ABSORPTION OF TOXIC AGENTS PART 2 THE NERVE BASES AND SOME OTHER TOXIC ORGANOPHOSPHATES A SURVEY OF THE LITERATURE**

C vanHooendonk Jan 1978 44 p refs In DUTCH ENGLISH summary

(PML-1978-9 TDCK-70699) Avail NTIS HC A03/MF A01

Quantitative data on the penetration rates of nerve gases and some other toxic organophosphates (pesticides) are collected from the open literature. An introduction is given on the properties of the skin and the percutaneous absorption of compounds in general. A survey was made of the open literature on the above compounds L L

**N79-17543#** Pennsylvania State Univ University Park  
**EVALUATION OF BIOFEED THERAPY Final Report**

William J Ray Aug 1978 231 p refs

(Contract PHS-PLD-07841-77)

(PB-287777/7) Avail NTIS HC A11/MF A01 CSCL 06P

Selected studies are reviewed in relation to evaluate questions of a scientific, historical and pragmatic nature and is designed to present some ideas regarding the state of the art of biofeedback therapy. Every clinical study performed and reported during the period 1967-1977 is outlined to present important variables to comparing the outcome of one study with another GRA

**N79-17544#** Pennsylvania State Univ University Park  
**EVALUATION OF CLINICAL BIOFEEDBACK Final Report**

William J Ray Aug 1978 115 p refs

(Contract PHS PLD-07841-77)

(PB-287776/9) Avail NTIS HC A06/MF A01 CSCL 06P

An attempt to assess the first decade of clinical biofeedback research and practice is presented. Scientifically, there are three major problems which the field must address: first the problem of models or theoretical orientations; second the problem of methodology; and third the question of nonspecific or placebo factors. As might be predicted concerning a new field, there are few well controlled studies that clearly point to the positive delineation of biofeedback as the active ingredient in the total therapeutic presentation. The role of nonspecific or placebo factors has not been adequately assessed, nor have there been presented models for understanding the role of nonspecific factors or subject variables in clinical biofeedback work. In spite of these problems, there are studies that suggest that biofeedback is a useful treatment and in some cases even the treatment of choice for certain disorders. If nothing else, clinical biofeedback has performed the service of helping to change the conceptualizations of the patient from the passive receiver of medical benefits to the active agent in his or her own move toward health. GRA

**N79-17545#** Goteborg Univ (Sweden) Inst of Neurobiol-ogy

**A COMPACT LOW-VOLUME, SELF-REGENERATING ARTIFICIAL KIDNEY Annual Report, 1 Jan 1977 - 30 Mar 1978**

Holger Hyden 30 Mar 1978 19 p

(Contract N01-AM-6-2200)

(PB-287808/0 AK-2-6-2200) Avail NTIS HC A02/MF A01 CSCL 06L

The compact low-volume artificial kidney was improved mechanically and electronically. Urea removal is attained by two interconnecting loops of circulation, each containing a charcoal cartridge which are alternatively used and with respect to urea adsorbance. The carbon particles are surrounded by cation-rejecting membranes. The water solution of urea finally obtained is concentrated and sorbed by a resin. Attempts to reduce the size of compounds of complex 7 by insolubilized carboxypeptidase have proceeded satisfactorily. Break-down of urea by nitrite in a dialysis system has proven to be efficient. Studies are going on to see if toxic products occurring during the process can be removed. GRA

**N79-17546#** Federal Aviation Administration Washington D C Office of Aviation Medicine

**PSYCHOPHYSIOLOGICAL EFFECTS OF AGING DEVELOPING A FUNCTIONAL AGE INDEX FOR PILOTS 3 MEASUREMENT OF PILOT PERFORMANCE**

Siegfried J Gurathewohl Aug 1978 61 p refs

(FAA-AM-78-27) Avail NTIS HC A04/MF A01

If a functional age index for pilots is to be developed that can be used as a criterion for extending or terminating an aviator career, means for the assessment of pilot proficiency must be available or devised. The most advanced concept of measuring pilot performance is based on automated data recording and processing independently of or in conjunction with the judgment and interpretation of an instructor, examiner or inspector. Owing to the capability of simultaneously monitoring the performance of the human operator and the aircraft, automatic inflight monitors are the ultimate in systems design and application. Their implications for the development of a functional age index for pilots are discussed. Author

**N79-17547#** Civil Aeromedical Inst Oklahoma City Okla  
**A METHOD TO EVALUATE PERFORMANCE RELIABILITY OF INDIVIDUAL SUBJECTS IN LABORATORY RESEARCH APPLIED TO WORK SETTINGS**

Alan E Jennings Oct 1978 7 p refs

(FAA-AM-78-37) Avail NTIS HC A02/MF A01

A method that may be used to evaluate the reliability of performance of individual subjects, particularly in applied laboratory research, is presented. The method is based on analysis of variance of a tasks-by-subjects data matrix, with all scores standardized. If all tasks are parallel, then the average correlation among tasks is an inverse function of the within-subject variance, which may be computed for any individual subject or group of subjects. The formula for determining the relationship between within-subject variance and average correlation is developed, and a method of testing the reliability of individual subjects against the general level of reliability is presented. Possible applications of the method are noted. G Y

**N79-17548#** System Development Corp Santa Monica Calif  
**EVALUATION OF FOUR TARGET-IDENTIFICATION TRAINING TECHNIQUES**

John T Cockrell Aug 1978 36 p refs

(Contract DAHC19-67-C-0040)

(AD-A061175 ARI-TP-301) Avail NTIS HC A03/MF A01 CSCL 17/7

As part of a research program seeking more efficient methods of training image interpreters in target identification, four alternative experimental instructional techniques were evaluated. Eight recently trained image interpreters used each method. Two of the four methods used pictures instead of text: one in a random presentation and the other in a structured sequence of increasing difficulty. The third method used programmed text to teach verbal identification cues, and the fourth combined programmed text in the first half and the structured pictorial method in the last half of training. In each method, half the students received feedback of both the correct answer and the reason a wrong answer was wrong, and half received only the correct answer. Students were evenly divided across all conditions by their general technical (GT) aptitude score: high (at or above 124) and low (below 124). Posttests on visual target identification and verbal target cues evaluated the effectiveness of the methods and feedback conditions for each GT level. GRA

**N79-17549#** Science Applications Inc Arlington Va  
**IMAGE PROCESSING PROGRAM COMPLETION REPORT Final Summary Report**

Duane W Small 10 Aug 1978 42 p refs

(Contract MDA903-78-C-0095 ARPA Order 3456)

(AD-A061597 SAI-79-798-WA) Avail NTIS HC A03/MF A01 CSCL 05/8

A review of the technical work completed under the Image Processing Program was performed. This review included a description of the program, its objectives, and its evolution, a discussion of a variety of applicable technical approaches used.

such as bandwidth compression restoration and enhancement of images visual system modeling image modeling and mechanical analysis of images, and an assessment of the scientific and technical accomplishments Applications and considerations for the future were also discussed This report contains a bibliography of the technical reports reviewed

Author (GRA)

**N79-17550#** Air Force Inst of Tech Wright-Patterson AFB, Ohio

**THE IMPACT OF A LEARN-FORGET-LEARN (LFL) CURVE AND LEARNING CURVES ON A SYSTEM EFFECTIVENESS MODEL M S Thesis**

Dwight Edward Beauchamp 1978 92 p refs (AD-A061622 AFIT-CI-79-5) Avail NTIS HC A05/MF A01 CSCL 05/8

In only the last 25 years has operator reliability been incorporated with hardware reliability to obtain a value for the effectiveness of a man-machine system Very seldom, and in most cases, never, do any of the human reliability models address the effect that operator learning has on human reliability and the subsequent impact that operator reliability has on system effectiveness This research studied the sensitivity of a system effectiveness model to changes in operator learning levels Learning data which was expressed in terms of performance versus time was obtained from a paper which analyzed the performance of an actual manufacturing task This data was utilized to develop three different curves - a log pseudo-learning curve a cubic pseudo-learning curve and a Learn-Forget-Learn (LFL) curve Each curve expressed operator performance as a function of time The expressions for each of the three curves were then utilized in conjunction with a system effectiveness simulation model to formulate values for system effectiveness The various values of system effectiveness obtained from the simulation demonstrated that the model was sensitive to changing levels of operator performance This research is unique because this is the first time that operator learning curves have been utilized in conjunction with a simulation of system effectiveness

Author (GRA)

**N79-17551#** Human Engineering Labs, Aberdeen Proving Ground Md

**A REVIEW OF INDIVIDUAL PERFORMANCE IN AIR-TO-GROUND TARGET DETECTION AND IDENTIFICATION STUDIES Final Report**

John A Barnes Aug 1978 93 p refs (AD-A061580, HEL-TM-26-78) Avail NTIS HC A05/MF A01 CSCL 05/9

This document is a review of the individual performances of the skilled aviators who participated in the US Army Human Engineering Laboratory Target Acquisition Camouflage Application and Identification Friend or Foe tests and the Modern Army Selected Systems Evaluation Test Evaluation and Review Cobra/Tow Follow-On Evaluation It highlights the individual performance differences in target detection and identification slant range and time and in eye fixations and scanning behavior against stationary and moving camouflaged and uncamouflaged armor

Author (GRA)

**N79-17552#** Maryland Univ College Park Computer Science Center

**REGION EXTRACTION USING CONVERGENT EVIDENCE**

D L Milgram Jun 1978 26 p refs (Contract DAAG53-76-C-0138) (AD-A061591 CSC-TR-674) Avail NTIS HC A03/MF A01 CSCL 05/8

Scenes consisting of spatially compact regions which contrast with their surrounds can be segmented by extracting connected components of above-threshold values whose borders match the positions of edges Edge/border coincidence thus defines a kind of optimal thresholding since for any object we can choose the threshold which maximizes the coincidence This illustrates how the redundancy of different information sources aids segmentation

Author (GRA)

**N79-17553#** National Aerospace Lab Amsterdam (Netherlands) Flight Div

**AN ANALYSIS OF HELICOPTER PILOT CONTROL BEHAVIOUR AND WORKLOAD DURING INSTRUMENT FLYING TASKS**

J Smit and P H Wewerinke 14 Feb 1978 14 p refs Presented at AGARD Aerospace Med Panel Specialists Meeting on Operational Helicopter Aviation Med Fort Rucker Ala 1-5 May 1978

(NLR-MP-78003-U) Avail NTIS HC A02/MF A01

During helicopter instrument hover- and navigation (tracking) tasks a number of flight data physiological measures and subjective ratings were collected Mathematical models were used to describe and analyze the pilot's control behaviour and attentional workload The optimal control model seems to offer a suitable framework for the description of control tasks as complex as helicopter instrument flying A control effort model which was formulated in terms of the optimal control model describes the relationship between performance and attention paid to the task The physiological variables and subjective ratings in general reflected the variations in control effort connected with the various tasks

Author

**N79-17554#** National Aerospace Lab Amsterdam (Netherlands) **INFLUENCE OF MOTION WASH-OUT FILTERS ON PILOT TRACKING PERFORMANCE**

M F C VanGool 1 Mar 1978 8 p refs Presented at AGARD Specialists Meeting on Piloted Aircraft Environment Simulation Tech Brussels, 24-27 Apr 1978

(NLR-MP-78005-U) Avail NTIS HC A02/MF A01

An investigation was carried out on the NLR moving base flight simulator to establish the influence of the simulator motion wash-out filters in the pitch and roll axis on the performance of four pilots when stabilizing an aircraft disturbed by turbulence in either of these axes For this compensatory tracking task pilot describing functions remnant spectra and other performance measures were determined The results lead to the conclusion that for the task under consideration no significant differences can be observed when the break frequency of the (linear second-order) wash-out filter is varied from 0.1 rad/sec to 0.5 rad/sec However performance in either condition is considerably better when compared to fixed-base results This is also reflected in the pilot comments and effort ratings stating that the task is easier with motion

LS

**N79-17555#** Research Inst of National Defence Stockholm (Sweden)

**QUANTIFICATION AND VALIDATION OF PERCEPT-GENETIC DEFENSE MECHANISM A HIERARCHICAL ANALYSIS OF BEHAVIOR OF PILOTS UNDER STRESS [DIMENSIONERING OCH VALIDERING AV PERCEPT-GENESENS FOERSVARSMKANISMER EN HIERARKISK ANALYS MOT PILOTENS STRESSBETENDE]**

Thomas Neuman Oct 1978 258 p refs In SWEDISH (FOA-C-55020-H6) Avail NTIS HC A12/MF A01

The applicability of the Defense Mechanism Test (DMT) as a predictor of the success of military pilots was studied Through several stages of obtaining improved objective norms and evaluation of results a theoretical holon model was constructed accounting for the relationship between the different phenomena manifested in the DMT results This model was then made the basis for a new norm system - NORM 78 NORM 78 was applied postdictively to a population of 760 pilots Their test results and performance grading were used for the construction of the norms up to NORM 78 DMT results expressed in the Neuman Plot Index (NPI) which combines partly NPI basic flight training and NPI pilot, was validated against the following criteria pass/fail in basic flight training and suitability/unsuitability in service performance over 6-12 years

GG

**N79-17556#** Research Inst of National Defence Stockholm (Sweden)

**PERCEIVED QUANTIZATION ERROR EFFECT OF QUANTIZATION FUNCTION, RECONSTRUCTION FUNCTION AND NUMBER OF LEVELS**

Hans Marmolin and Anders Sporrang Dec 1977 20 p refs (FOA-C-56015-H9) Avail NTIS HC A02/MF A01

A nonlinear fix quantifier based on the psychophysical function

for brightness was evaluated. This quantizer was compared to a linear one with respect to the amount of perceived quantization error. The number of quantization levels, the relation displayed luminance - digital level, and the form of the greylevel distribution of the scenes were varied. Results indicate that the proposed quantifier in general was better or as good as a linear one. It is demonstrated that at least 16 quantization levels should be used, and that these levels should be linearly related to displayed luminance. G G

**N79-17557# Aeronautical Research Labs Melbourne (Australia)  
IMPACT TESTS ON CRASH HELMETS FOR MOTOR CYCLISTS**

N D Hearn and S R Sarraillie Apr 1978 32 p refs  
(ARL/Struc-Note-445, AR-001-263) Avail NTIS  
HC A03/MF A01

Seven types of crash helmet were subjected to a series of impact tests as detailed in the current Australian Standard. Impact accelerations were usually less than 75% of the maximum permitted values, but second impacts near the front edge usually resulted in excessive accelerations. Four types of helmet, two with fiberglass and two with polycarbonate shells, were exposed to the weather for 15 to 17 months and one of the polycarbonate shells suffered degradation in its resistance to penetration.

Author

**N79-17558# Civil Aeromedical Inst Oklahoma City Okla  
THE MEASUREMENT AND SCALING OF WORKLOAD IN  
COMPLEX PERFORMANCE**

W Dean Chiles, Alan E Jennings, and Earl A Alluisi (Old Dominion Univ.) Sep 1978 14 p refs  
(FAA-AM-78-34) Avail NTIS HC A02/MF A01

Two groups of young men performed various combinations of the six tasks of the CAMI Multiple Task Performance Battery. Two of the tasks involved the monitoring of static (lights) and dynamic (meters) processes, the four more-active tasks involved mental arithmetic, elementary problem solving, pattern identification, and two-dimensional compensatory tracking. Five of nine performance intervals provided different complex tasks consisting of both of the monitoring tasks and two of the active tasks presented concurrently. Other trials provided data on the singly performed constituent tasks as well as the combined monitoring tasks. Results indicated that all 12 performance measures varied significantly as a function of the different task-combination conditions. A standard psychological scaling technique was applied to the monitoring data to develop an index of workload for the five complex task combinations. Since better performance was presumed to indicate a lower workload, workload was inferred to increase as performance declined across conditions. The best performances were associated with single tasks as expected. Scale values for the complex task-combination conditions were consistent between groups. J M S

**N79-17559# Naval Air Development Center Warminster, Pa  
ENVIRONMENTAL TEST AND EVALUATION OF A MOLECULAR SIEVE ON-BOARD OXYGEN GENERATION SYSTEM**

Matthew J Lamb and Richard L Routzahn 25 Aug 1978 45 p refs  
(AD-A061531, NADC-78163-60) Avail NTIS  
HC A03/MF A01 CSCL 06/11

Because of the high support costs, increase in aircraft down time, and hazards associated with the use of liquid oxygen, development has been progressing on On-Board Oxygen Generation Systems which have the capability of meeting the requirements of a two-man open loop breathing schedule. An evaluation program was conducted on an oxygen generator utilizing the molecular sieve concept of nitrogen absorption. The system was developed to establish unit performance in the environment anticipated during in-flight operation. Oxygen concentration has been evaluated as a function of inlet air pressure. GRA

**N79-17560# School of Aerospace Medicine Brooks AFB Tex  
THE DYNAMIC OXYGEN-REGULATOR TEST STAND  
Final Report, Jun 1976 - Dec 1977**

Ronald D Holden, F Wesley Baumgardner, and Bruce F Hiott

Jun 1978 13 p refs

(AF Proj 7930)

(AD-A060978, SAM-TR-78-25)

Avail NTIS

HC A02/MF A01 CSCL 14/2

The basic design of oxygen-breathing regulators has undergone minimal change during the last two decades. Performance standards for oxygen regulators have been based on continuous flows of gas at constant levels of flow, which do not represent the operational requirements of this equipment. To broaden the data base of oxygen-regulator performance characteristics, a test stand has been developed that imposes a wide range of constant and cyclically varying flows on the breathing-gas delivery system. Its use permits evaluation of oxygen-delivery equipment under more realistic conditions, which more closely match human breathing patterns. Using performance characteristics of oxygen regulators in the current USAF inventory test procedures are being established, and design criteria will be developed for a new generation of breathing-gas delivery systems. By meeting these criteria, oxygen-delivery systems will be more appropriately responsive to the actual physiological requirements of crewmembers in high-performance aircraft. Author (GRA)

**N79-17561# Bolt Beranek and Newman Inc, Cambridge Mass  
Control Systems Dept**

**MOTION CUE MODELS FOR PILOT-VEHICLE ANALYSIS  
Final Report, 1 Jan - 30 Sep 1977**

Greg L Zacharias Wright-Patterson AFB Ohio AFML May 1978 97 p refs

(Contract F33615-77-C-0506, AF Proj 2312)

(AD-A061477, AMRL-TR-78-2)

Avail NTIS

HC A05/MF A01 CSCL 14/2

This report summarizes the results of a motion sensation literature review conducted to identify current motion cue models which might be used to model pilot behavior in a motion environment. Models for the vestibular end organs are critically reviewed as are models for subjective sensation of self-velocity and orientation. Modeling deficiencies are identified in terms of body-axis orientation, dynamic response, and threshold behavior. The model implications for workload and cue predictability in a closed-loop piloted task are also discussed. Author (GRA)

**N79-17562# Institute for Perception RVO-TNO Soesterberg  
(Netherlands)**

**SOME ERGONOMIC ASPECTS OF ADAPTING WORK-  
ROOMS WITH VISUAL DISPLAY UNITS TO THE HUMAN  
POSSIBILITIES**

H J Leebeek 1978 19 p refs In DUTCH, ENGLISH  
summary

(IZF-1978-1, TDCK-70335) Avail NTIS HC A02/MF A01

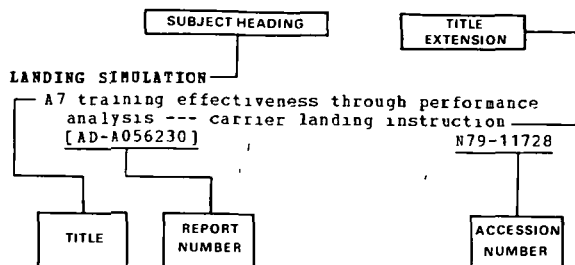
Ergonomic considerations involved in the planning of workrooms with visual display units are discussed. Good working posture, equipment operation, screen display legibility, and workroom layout are among the topics covered. J M S

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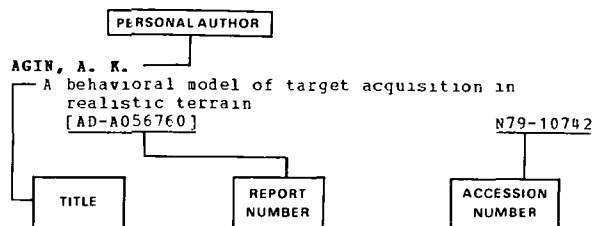
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